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THE HEATING AND VENTILATING MAGAZINE

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NEW YORK, NOVEMBER, 1914

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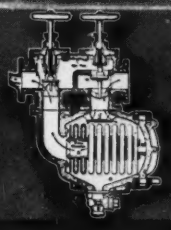

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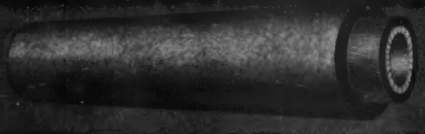

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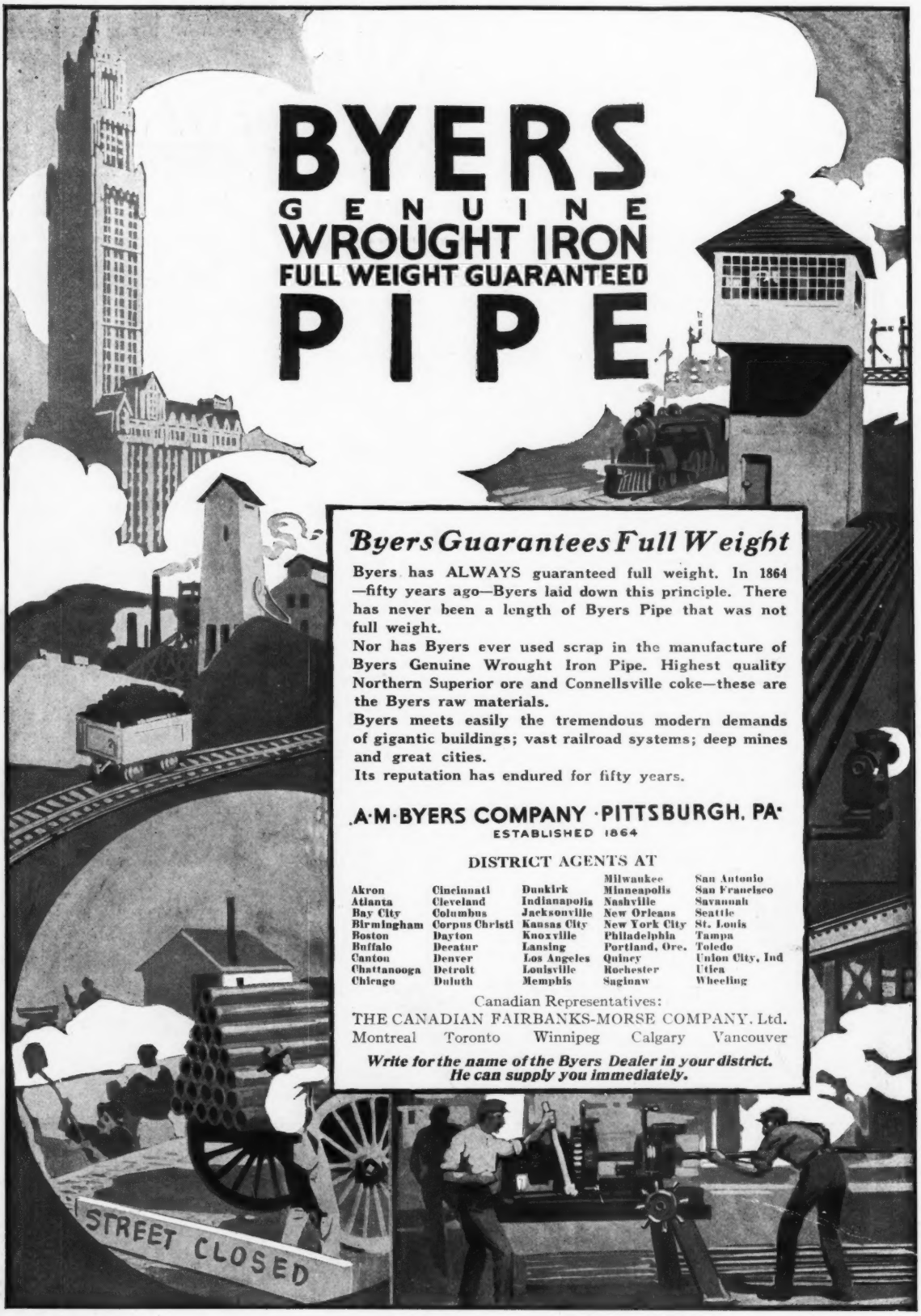

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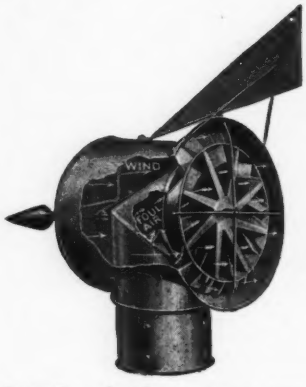

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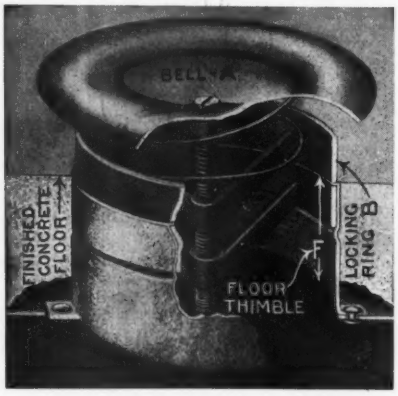

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THE HEATING AND VENTILATING MAGAZINE

1123 BROADWAY NEW YORK NOVEMBER, 1914

Cooling and Ventilating Arrangements for Office Quarters

DETAILS OF SYSTEM INSTALLED AT PLANT OF U. T. HUNGERFORD BRASS & COPPER CO., NEW YORK.

In the accompanying plans is shown a scheme for ventilating the office quarters of a manufacturing building and at the same time cooling the air in summer to a point at least 7° below the temperature of the outdoor air. For this latter purpose, water from a deep well at an average temperature of 55° F. is used. When the matter was first taken up, it was proposed to install a small refrigerating plant to cool the water used in the air washer. While this arrangement was being considered, it developed that the company contemplated making use of a deep well from which it was proposed to supply water to the house tank used for flushing purposes for the plumbing fixtures. Inasmuch as the requirements for this purpose was estimated at about 100 gals per minute, advantage was taken of this fact and an apparatus has been designed to utilize this water for washing and cooling.

The quarters ventilated and cooled are the second floor of the Hallenbeck-Hungerford Building at 76-88 Lafayette Street, New York. The ventilating system consists of a fan having a capacity of 20,000 cu. ft. of air per minute, which is mounted on the third floor of the building adjoining; this is run in connection with an air washer. Provision is made for heating the air through Vento heaters. The intake for the fan is located at one of the window openings and the incoming air is heated with sections of Vento primary heaters, behind which is placed the air washer and beyond this, sections of Vento secondary heaters, connecting thence to the fan.

The air passes from the fan through the duct system, coming through the wall supporting the two buildings and discharging through a system of openings near the ceiling. Provision is made for recirculating the air through a recirculating duct which is placed immediately under the fresh air supply duct and leads back into the fan chamber.

The deep well from which the cold water is obtained for the air washer when cooling is desired, is located in the basement of the Hallenbeck-Hungerford Building near the engine-room, as shown on the accompanying plan.

Water from the deep well is supplied to a steel tank 18 ft. long and 6 ft. in diameter, located in the basement of the building containing the fan-room. It was necessary to build this tank in three sections in order to bring it into the building. From one of the 3 in. connections at the bottom of the tank a 3 in. line is run to the suction side of the circulating pump and from the discharge side of the circulating pump a 3 in. line is run on the ceiling of the basement through the basement wall and up through the adjoining

building, connecting thence into the air washer supply line. Arrangements are made so that all of the water from the air washer can go into the water tank or into the suction of the house pump by means of a 3 in. line running from the air washer to the water tank and to the suction line system of the house pump. Gate valves are placed at the necessary points to operate these cross connections. With the average temperature of the deep well water at 55° F., it is guaranteed that the ventilating apparatus will reduce the temperature of the air supplied to it, when at 77° F. wet bulb temperature, to a dew point of 70° F., also that the air delivered from the air washer shall be free from entrained water.

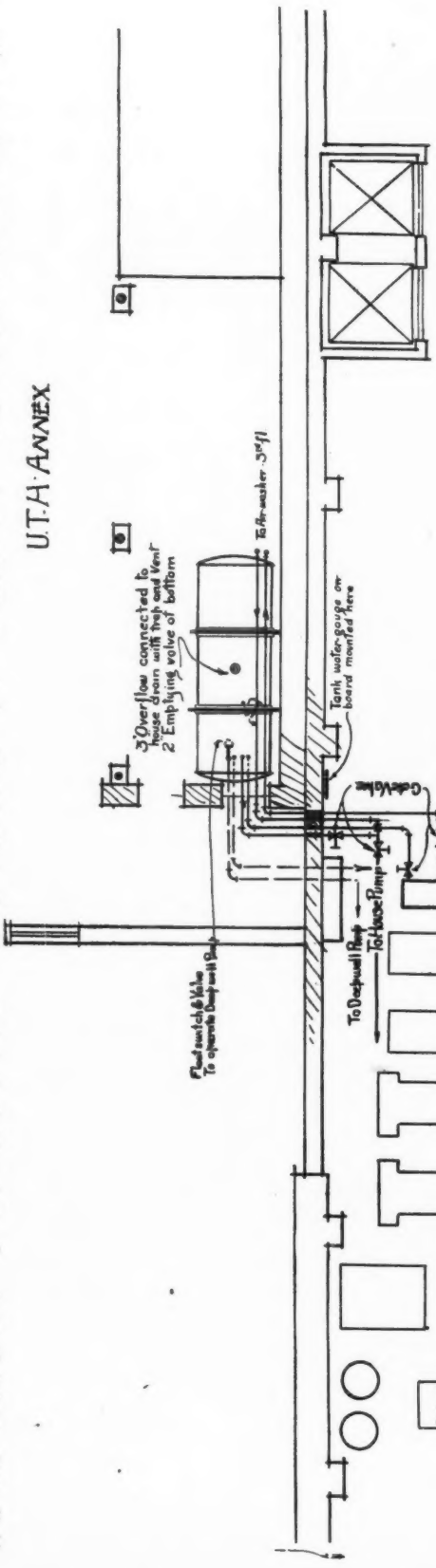
The general arrangement of the fan-room may be seen from the illustrations. The enclosure is built of 2 in. by 4 in. studding, while the intake screen is of the full size of the window opening and made of galvanized iron with a ¾ in. mesh.

To cut off the air supply from the outside, it is intended to use the iron shutters which were already installed.

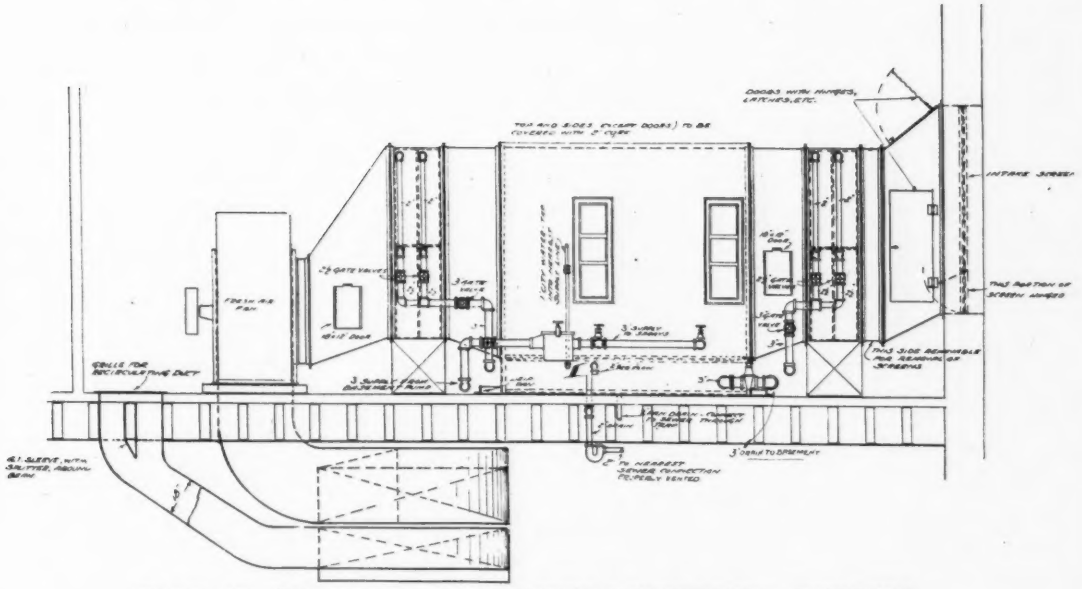
The fan used is of the full housed multivane type, single inlet, single width, having a capacity of 20,000 cu. ft. of air per minute against a resistance of the system as shown. The fan is chain-driven by a 7½ H.P. electric motor, direct current, 240 volts, 825 R.P.M. compound wound, controlled by a Cutler Hammer speed regulator.

The heater used is made up of 40 in. regular Vento sections, placed on 5⅜ in. centers, twelve loops wide and two sections high. This is divided into two sections deep for the tempering coil and two sections deep for the reheater coil, giving a total of 1,030 sq. ft. of surface. A sheet steel enclosure built up with angle iron bracing and frames completely encases the tempering coil, air washer, and reheating coil.

The air washer used is of the Carrier type, designed to handle 125 gals. of water per minute. This apparatus, when handling 20,000 cu. ft. of air per minute and when furnished with 125 gals. of water per minute at a temperature of 55° F., is guaranteed as stated, to reduce the air from the wet bulb temperature of 77° F. to a dewpoint of 70° F. At the same time the air must be delivered without


U.T.A. ANNEX
To Air-washer 3"ø
3" Overflow connected to house drain with trap and vent
2" Emptying valve of bottom
Tank water-gauge on board mounted here
Check Valve
Cut-Out
To House Pump
To Deepwell Pump
Float switch & Valve To operate Deepwell Pump
Deepwell Pump

ARRANGEMENT OF WATER TANK AND CONNECTIONS IN BASEMENT OF HALLENBECK-HUNGERFORD BUILDING.



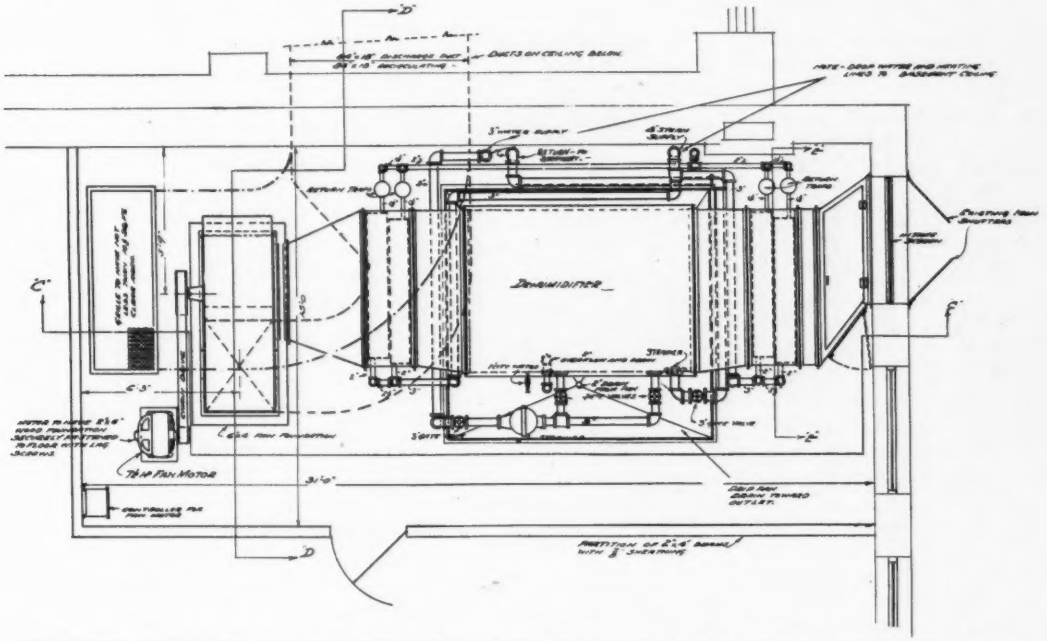
PLAN OF FAN ROOM, HALLENBECK-HUNGERFORD BUILDING.

entrained water, besides fulfilling the guarantee for the removal of 98% of the solid matter entering the washer.

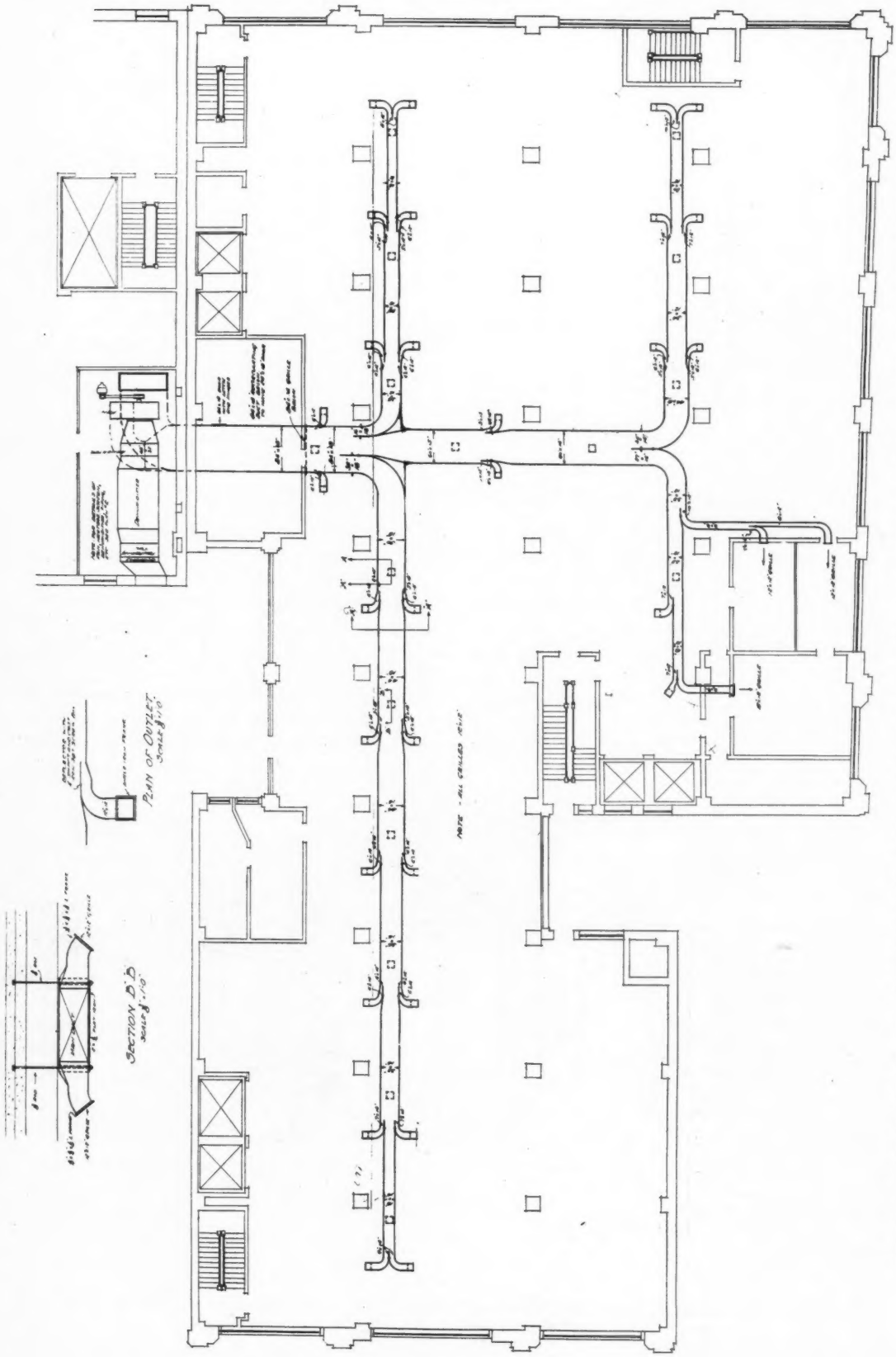
The pump used for recirculating the water for washing the air is a 2½ in. centrifugal pump of the double-suction type. It is direct connected to a 10 H.P. direct current motor, and located in the basement. When in use, the pump is designed to deliver 125 gals. of water per minute to the nozzles of the air washer at 25 lbs. pressure.

In addition to the supply from the deep well, a 1 in. line from the city water main is run to the air washer so that city water can be used in this apparatus when desired.

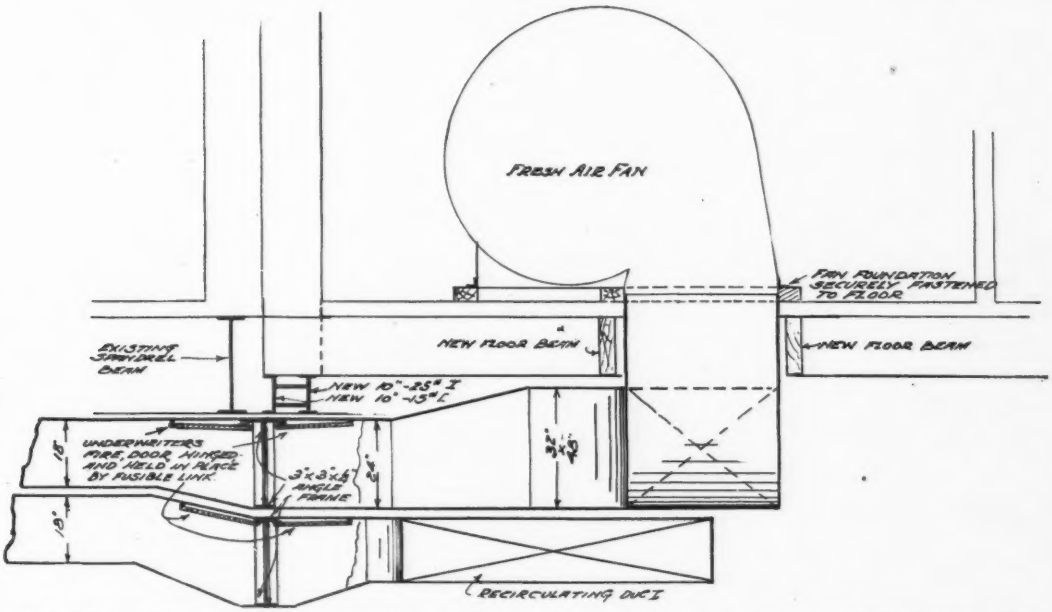
For the steam supply to the heaters a 4 in. connection is taken from the 7 in. main on the ceiling of the new building



SECTION ON LINE C-C OF HEATING AND COOLING UNIT FOR HALLENBECK-HUNGERFORD BUILDING.



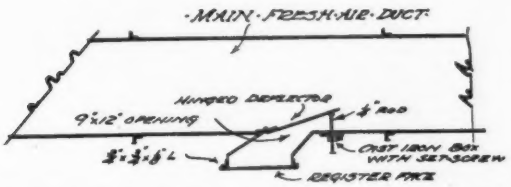
SECOND PLOOR PLAN OF HALLENBECK-HUNGERFORD BUILDING, SHOWING PROVISIONS FOR RECIRCULATING AIR.


FRESH AIR FAN
FAN FOUNDATION SECURELY FASTENED TO FLOOR
EXISTING SPANDREL BEAM
NEW FLOOR BEAM
NEW FLOOR BEAM
NEW 10"-25# I
NEW 10"-15# I
UNDERWRITERS FIRE DOOR HUNGED AND HELD IN PLACE BY FUSIBLE LINK
3"x3"x5/16" ANGLE FRAME
RECIRCULATING DUCT

SECTION ON LINE D-D, SHOWING FRESH AIR FAN AND DUCT CONNECTIONS FOR HALLENBECK-HUNGERFORD BUILDING.

basement. The line is run through the walls separating the old and new building and connected thence to the coils. The returns are 2½ in. in diameter and connect with the main return line in the new building.

A feature of the air washer installation is that it is covered on both sides, top and bottom with 2 in. Nonpareil cork covering. The angles of the air washer were punched for receiving the supports for this covering which was applied with pitch to make it air tight. All cold water lines between the water tank, the pump and the air washer are covered with 1 in. Nonpareil moulded sectional cork covering, applied with all joints broken, wired in position and filled with pitch to prevent moisture from working to the inside. In addition an extra covering of 10 oz. canvas is added, painted with two coats of paint.



SECTION ON LINE A-A OF SECOND FLOOR PLAN, TYPICAL FOR ALL REGISTERS AT BOTTOM OF DUCT.

The system was designed by Walter S. Timmis, consulting engineer, 315 Fifth Avenue, New York, and the installation is being made by the Wells & Newton Company, New York.

Exhaust Ventilation with Tightly-Constructed Windows.

One of the first ideas advanced by Dr. Evans, formerly health commissioner of Chicago, was that the proper way to ventilate a room was to open a window from the top and let the cold air in so that the cold air would be tempered by the heated air normally at the ceiling to a point where it would not be objectionable and cause drafts. This way of ventilating when it works seems to approach ideal ventilation.

One criticism that has been made against modern methods of ventilation is the tightness of the building construction. The exhaust system in an ordinary room with ordinary leakage is most uncomfortable because of the cold air coming in through the cracks. It has never been proven that the exhaust system in an entirely tight room will not give us very much better ventilation than the plenum system, because of the fact that the air may be introduced in very many places at low velocity, which is impossible with the plenum system, especially when the air handled with the plenum system has been already heated.—*President S. R. Lewis before the Heating Engineers' Society.*

Laboratory Experiments With Air

By FREDERIC S. LEE, Ph.D.,

Dalton Professor of Physiology, Columbia University College of Physicians and Surgeons; Member of the New York State Commission on Ventilation.

(Read before the Section on Hospitals at the meeting of the American Medical Association, held in Atlantic City, in June, 1914, and published November 7, 1914, in The Journal of the association.)

I take it that it is my part in the present symposium to present a summary of what laboratory investigation has contributed to our knowledge of air in its bearing on the problem of ventilation. In so far as the contributions of the laboratory are conclusive they may be expected to serve us as a guide to the architect and the ventilating engineer in devising means to provide human beings, living within buildings, with air that is fitted for human use. Air may be rendered unfit by a great variety of agencies. For our present purpose it is desirable to limit our consideration to the unfitness that results from the immediate presence of human beings.

DEVELOPMENT OF CARBON DIOXIDE AIR TEST.

That human beings vitiate the air surrounding their bodies has been known from earliest times, and at different stages in the progress of investigation such vitiation has been ascribed to different factors. More than a century before the discovery of oxygen, Mayow ascribed the death of animals confined within closed spaces to their consumption of the "nitro-aerial spirit" of the air. The presence in expired air of "noxious vapors" was also early recognized. Later, nitro-aerial spirit became oxygen, and noxious vapors carbon dioxide, and the idea early became prevalent that lack of the one constituent and accumulation of the other were together responsible for the bad effects of rebreathing air that had once been breathed by human beings. Throughout the nineteenth century, many laboratory experiments were performed relating to the relative roles played by the deficiency of oxygen and the increased quantity of carbon dioxide, and there resulted much difference of opinion. But, notwithstanding the inadequacy of its proof, the belief became firmly established that both of these gases, but more especially the carbon dioxide, are the chief agents in producing the evil effects of the air of crowded assemblies, and this idea is even now widely prevalent.

THE EXPIRED AIR POISON THEORY.

Meanwhile, early in the nineteenth century, the notion arose that expired air contains a poisonous substance, other than carbon dioxide, which can be detected by the sense of smell. Gavarret in 1851 seems to have been the first to subject his idea to the test of experiment, and his work seemed to establish its validity, since he found that animals confined within a closed space died, although oxygen was supplied as fast as it was consumed and carbon dioxide was removed as fast as it was formed. A few others obtained analogous results, notably William A. Hammond[1] in America in 1863. In 1887 Brown-Séquard,[2] of Paris, gave a great impetus to investigation of this thory by reporting confidently their experimental results in which the expired air of men and dogs, condensed and injected into animals, seemed to produce symptoms of intoxication, and they defended vigorously the presence of a toxic organic substance in such air. Although many subsequent researches by others contradicted their conclusions, the theory of the presence in expired air of poisonous, volatile, organic matter, probably protein in nature, came to be widely accepted, and doubtless is accepted still in many circles. Du Bois Reymond gave the name "anthropotoxin" to this substance.

It thus seemed to be firmly established,

[1]Hammond. A Treatise on Hygiene with Special Reference to the Military Service, Philadelphia, 1863.
[2]Brown-Séquard and d'Arsonval: Compt: rend. Coc. de biol., 1887, iv, 814. This article was followed by several others by the same authors.

by what seemed to many persons accurate laboratory investigations, that the air problem involved was a problem of chemistry, that the physiologic problem was a problem of respiration, and that the ventilating problem was a problem of removing chemically impure, and supplying chemically pure air in sufficient quantities to supply the needs of the individual.

LABORATORY INVESTIGATIONS.

But this calm of supposed scientific certainty was never so universal throughout the laboratories, and in recent years it has become so disturbed that the subject of what constitutes purity in air and to what are due the evil effects of living in impure air has assumed a new aspect. In the first place, faith in the adequacy of lack of oxygen and accumulation of carbon dioxide has been practically abandoned in the laboratories. Even as early as 1841 Leblanc found that in crowded assemblies the oxygen content of the air rarely falls below 20%, and in 1849 Regnault and Reiset proved experimentally that oxygen can be diminished to 10% in inspired air before respiration becomes quickened. Müller in 1858, Bert in 1870, Speck in 1878, Friedländer and Herter in 1879, and others obtained similar experimental results. As to carbon dioxide, too, Regnault and Reiset, Müller, Friedländer and Herter, and others demonstrated that large percentages of the gas, much larger percentages than exist in crowded rooms, can be inspired without marked effect. Von Pettenkofer, too, in 1862, seems to have had a clear idea that neither the decrease of oxygen nor the increase of carbon dioxide that occurs in ill-ventilated places is sufficient to produce the symptoms observed in the occupants of the rooms. It was he, nevertheless, who contributed the thought, ever since potent, that the amount of carbon dioxide that is present may be regarded as a convenient index of the harmfulness of the air. However valuable this suggestion may have been at the time, in the light of present knowledge its usefulness has ceased, and it ought, I believe, to be discarded. The later work of Hermans, Flügge, Paul, Hill and others now seems to eliminate oxygen and carbon dioxide wholly as factors in the situation except under very unusual circumstances.

ATMOSPHERIC, ORGANIC POISON UNTENABLE.

Furthermore, a number of notable investigations have rendered the theory of an atmospheric, organic poison untenable. Here it is only necessary to mention a few of the prominent names of investigators, such as Hermans in 1883, Haldane and Smith in 1892, and Billings, Mitchell and Bergey[3] in 1895. In 1911 Rosenau and Amoss attempted to revive the idea by experiments in which guinea-pigs were supposed to be sensitized anaphylactically by the injection of the residue of condensed expired air; but Weisman,[4] in a careful repetition and continuation of their experiments, has been unable to confirm their results. The matter may therefore, I think, be regarded as finally settled that expired air contains no volatile, toxic organic constituent.

GROWTH OF "AIR ENVELOPE" THEORY.

Simultaneously with the abandonment of oxygen, carbon dioxide and anthropotoxin, a totally different way of looking at the physiologic problem has appeared. In 1883 Hermans, of the Hygienic Institute in Amsterdam, convinced of the inadequacy of the oxygen and carbon dioxide theory, finding by his own experiments no evidence of the existence of an organic poison and observing that his own bodily temperature in crowded theatres and churches rose from 0.3 to 0.6 C., put forward the suggestion that the evil effects of air that has been vitiated by human beings are due simply to the inability of the body to cool itself because of the surrounding elevated temperature and increased moisture. This suggestion was not discussed by him in great detail and was not supported by experimental evidence of his own, but it provided the much needed germinal thought that has since developed into the most rational of all proposed explanations of the observed facts.

---

[3]Billings, Mitchell and Bergey: The Composition of Expired Air, Smithsonian Contrib. to Knowl., Washington, 1895, p. 989.

[4]Weisman: Biochemical Studies of Expired Air in Relation to Ventilation, Inaug. diss. Columbia Univ., New York, 1913.

Briefly stated, this explanation is as follows: Living beings constantly produce and give off to their environment an excess of bodily heat. This heat must be constantly carried away from the body and is carried away partly through the lungs in the expired air, but chiefly through the skin by the processes of radiation, conduction through the clothing and the evaporation of perspiration. It is obvious that to insure this necessary and healthful removal of heat there is needed an atmosphere about the body that is neither too hot nor too humid. If it is too hot, radiation and conduction are prevented; if too humid, the evaporation of perspiration is interfered with; and if the two conditions exist simultaneously the result is a rise of bodily temperature with concomitant interference with the body's well-being. According to this conception, the air problem involved is a problem of physics, and not of chemistry; the physiologic problem is a problem that begins with the skin and not the lungs; and the ventilating problem is a problem of maintaining the proper temperature, humidity and motion of the air.

That this explanation of the matter in question is correct can, I think, hardly be doubted in view of the abundant evidence in its favor that has emanated from the laboratories. To speak the names of the chief contributors is to mention some of the prominent of the world's physiologists and hygienists. Rubner and von Lewaschem,[5] of Berlin, have contributed very exact data on the general action on the human body of moist air, the relation between the moisture and temperature of the air and the elimination of water and carbon dioxide from the body, and the adaptability of man to high and low temperatures.

The year 1905 was fruitful in contributions. Then began the many studies of Haldane,[6] of Oxford, and his pupils on the physiologic action of hot and humid air, which have been pursued partly in the laboratory and partly in industrial works, such as the tin mines of Cornwall and the British cotton-weaving sheds. Haldane has insisted, probably correctly, that the ill effects produced by the air of ill-ventilated places are dependent not simply on the temperature as indicated by the dry-bulb thermometer, or on the absolute or relative humidity alone, but on the temperature as indicated by the wet-bulb thermometer. "If this exceeds a certain point (about 78° F. or 25.5° C.)," he says, "continuous hard work becomes impracticable; and beyond about 88° F. or 31° C. it becomes impracticable for ordinary persons even to stay for long periods in such air, although practice may increase to some extent the limit which can be tolerated. In moving air, on the other hand, the limit is extended upward by several degrees." In ordinary living rooms a wet-bulb temperature of 60° F. is probably the most rational one.

In the year of Haldane's first article, 1905, there appeared also several very valuable and suggestive contributions by the hygienist Flügge,[7] of Breslau, and his assistants, Heymann,[8] Paul[9] and Ercklentz.[10] The experiments of these investigators were conducted on human beings, some in health and others in various pathologic conditions, who were enclosed within a ventilation chamber and subjected to various conditions of temperature, moisture and movement of air. The results emphasize very strongly that the evil symptoms ensuing on confinement in closed rooms are due to the heat stagnation and the inability of the occupants to "unwarm" their bodies. More recently Leonard Hill,[11] of the London Hospital, and his colleagues, Flack, McIntosh, Rowlands and Walker, have performed similar experiments, also on human beings, and have obtained similar and striking results.

EXCESSIVE HEAT, HUMIDITY AND LACK OF ADEQUATE AIR MOVEMENT DECLARED TO BE THE CAUSES OF POOR VENTILATION.

I have thus mentioned the more prominent of the many investigations that have emanated from the laboratories in this

[5]Rubner and von Lewaschew: Arch. f. Hyg., 1897, xxix, 1.

[6]Haldane: Jour. Hyg., 1905, v. 494. Haldane, Pembrey, Collis, Boycott and Cadman: Rep. Dept. Com. on Humidity and Ventilation in Cotton Weaving Sheds, London, 1909 and 1911.

[7]Flügge: Ztschr. f. Hyg., 1905, xlix, 363.

[8]Heymann: Ztschr. f. Hyg., 1905, xlix, 388.

[9]Paul: Ztschr. f. Hyg., 1905, xlix, 405.

[10]Ercklentz: Ztschr. f. Hyg., 1905, xlix, 433.

[11]Hill, Flack, McIntosh, Rowlands and Walker: The Influence of the Atmosphere on Our Health and Comfort in Confined and Crowded Places, Smithsonian Misc. Collections, 60, 23, Washington, 1913.

much-discussed field in which pure science and applied science meet. The main features of the laboratory contributions which may be regarded, I think, as now fairly established are that the evil effects of the living in the air of crowded, ill-ventilated rooms are due, not to lack of oxygen, not to accumulation of carbon dioxide, not to the presence of a volatile organic poison, but to excessive heat, excessive humidity, and lack of adequate movement. Notwithstanding the fact that more than thirty years fruitful in experimental confirmation of it have now elapsed since this doctrine was first enunciated, it is strange how little it is yet known outside the laboratories and how prevalent are the notions that carbon dioxide and a mysterious organic poison are the evils to be guarded against.

If I were to criticize in general the laboratory investigations, my criticisms would be three: first, that the investigaitons have been confined too much to the study of extreme conditions, in contrast to the conditions of ordinary life; secondly, that the individual experiments have been continued for too brief intervals; and, thirdly, that they have not shown, beyond a few of the more easily demonstrated bodily functions, such as rise of bodily temperature, on what functions of the complex living mechanism the unfavorable air conditions act deleteriously.

EXPERIMENTS OF THE NEW YORK VENTILATION COMMISSION.

The newest of all the many investigations in this field, that of the New York Commission on Ventilation, is endeavoring to obviate such criticisms by making a more profound study of the matter than has yet been undertaken. We possess a ventilation chamber of a capacity of 1,150 cu. ft., which is provided with apparatus by which the air of the chamber may be confined and rebreathed, or renewed at any desired rate, may be maintained at any desired temperature and humidity, may be kept quiet or in motion, may be removed, washed and recirculated, and may be given a desired chemical composition. In this chamber from one to a half dozen persons may be confined for any desired number of hours. On certain days they engage in definite mental tasks, on other days they perform a definite amount of physical work, under a definite combination of air conditions. By the quantitative study of a considerable number of bodily functions, such as bodily temperature, the sensitivity of the skin, blood-pressure and pulse rate in the reclining and standing positions, the relation of oxyhemoglobin to oxygen, the respiratory exchange, the size of the dead space of the air passages, carbohydrate and protein metabolism, the production of heat, the duration of digestion, and various phenomena of the urine, an endeavor is being made to learn in what respects, if any, the physiologic functions and the mental and physical efficiency of the individual are altered by alterations in air conditions. This work is now being actively carried on, but the results are not yet ready for publication.

TESTS ON CATS IN SMALL VENTILATION CHAMBER.

In this connection I may be permitted to mention a series of experiments which I have recently performed in my own laboratory in collaboration with Dr. E. L. Scott, and which are not yet completed. I have been interested to know whether the apparent physical inefficiency of the individual in an atmosphere of high temperature and high humidity can be objectively demonstrated as a muscular phenomenon. Because of the necessity of using isolated muscles, we found it most convenient to use cats as the subjects of experimentation and have confined them within a small ventilation chamber for a period of six hours each. An abundant supply of outside air has been sent through the chamber, and the only change in conditions has been that with certain animals the temperature has averaged 21° C. (69.8° F.) and the humidity 54%. With others the temperature has been raised to 33° C. (91.4° F.) and the humidity to over 89%; that is, one group of animals has been kept under favorable conditions, the other group has been given the air of a hot and humid New York summer day. Under the latter conditions the animals' bodily temperature rises, on an average, 0.5° C., or nearly 1° F. At the end of the period of six hours the cat is taken from the chamber and killed, and certain of the muscles are removed, attached to

levers and stimulated by regularly applied electric shocks. The contractions are recorded graphically, and the total duration of the working period and the total amount of work done before the muscle becomes exhausted are determined. It is found that the three muscles studied, the diaphragm, the extensor longus digitorum and the sartorius, are capable of performing a total amount of work which is less by 14, 18 and 26 per cent., respectively, in the animals exposed to the high heat and humidity than in those that have been subjected to the more comfortable atmospheric conditions. It would thus appear that the inefficiency of an individual under such unfavorable air conditions is not a matter of the nervous system only as might be inferred, but a matter of the muscles as well. Furthermore, we find that along with the muscular effect, the sugar of the blood is diminished from 0.069 gm. to 0.060, a diminution of 13%. The meaning of this is not yet clear, but it helps to indicate that the effect of unfavorable air conditions on the individual is more far-reaching than has heretofore been demonstrated.

It is by studies of this general nature that the laboratory is yet capable, I believe, of throwing much light on the general problem of the air in its physiologic relations. We must consent to a detailed analysis of the problem. To reiterate over and over again that air that has once been breathed is "bad" air and that "bad" air is "bad" air, without defining in what its badness consists, is a sin against not only scientific reasoning, but also common sense—and yet I have seen that sin committed. To urge, moreover, the great virtues of "fresh" air without making an effort to determine in what the virtues of "freshness" consist is suggestive of a mind that has not yet reached the sophomoric stage of its development—and yet such minds exist. The opponents of the laboratory doctrine of fresh air sometimes add to the gaiety of nations by speaking of such air in England as "tinned" air and in America as "canned" air. They forget that a canned thing is a dead thing, something without the power of moving of itself or of stimulating others. But the fresh air that we advocate with its coolness, its comparative dryness, and its constant motion is anything but lifeless. Its qualities are those which conduce most to the efficiency of the individual. Constant monotony in air conditions should be avoided like monotony in other conditions of life. It is not my function here to advise regarding ventilating methods, but it is obvious, I think, that no ventilating method can be expected to be effective unless it is based on the facts regarding human well-being which the laboratory is able to supply.

Typical Method of Heating Railroad Passenger Stations by Steam

By T. W. Reynolds.

A typical method of arranging radiation and piping for heating a railroad station by steam is shown in the accompanying plan. All mains and branches are laid under the floor, consequently the boiler is placed in a basement provided for that purpose under the station, the depth of the basement corresponding to the height of the boiler selected, plus the allowance made for a short rise of steam main from the boiler to the lines under the floor.

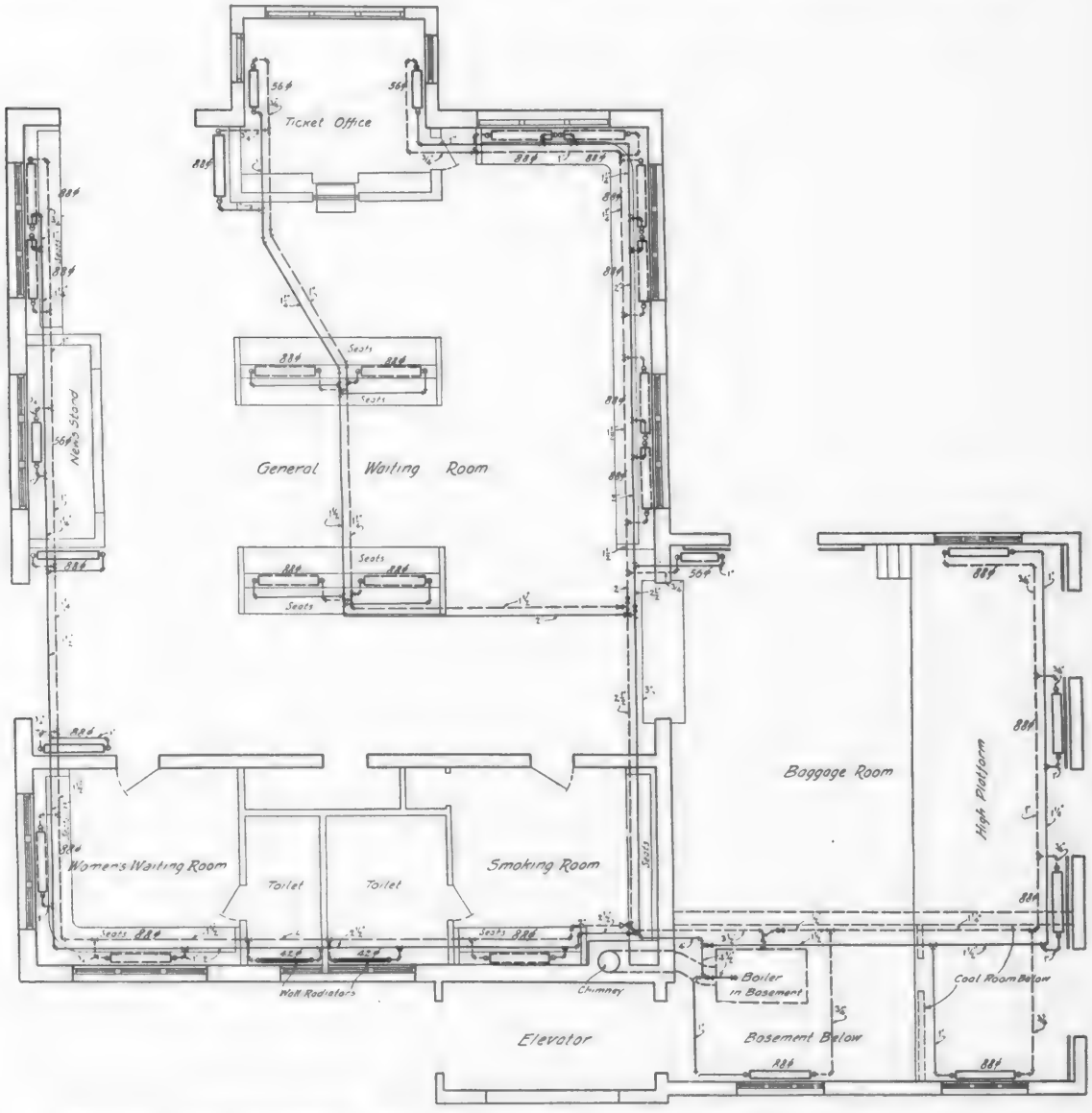
For architectural reasons, the location of the chimney and the side of the station from which coal may be received determine the location of the heater room. The length of the heater room is determined by the clearance required for the proper handling of tools at the heater, the coal being stored in a room at the rear.

In the typical layout, a sectional type of boiler is used as the future construction of small buildings near the station is always possible. These are usually heated by steam from the station boiler,

the capacity of which may then be increased by installing additional sections.

Open concrete trenches for pipes back of the seats are provided when the ground under the station is filled in. The

The piping is laid out with equal runs and amounts of radiation, thereby securing practically the same results from each group of radiators. To decrease the size of the mains, they are divided into as



TYPICAL ARRANGEMENT OF RADIATION AND PIPING FOR A RAILROAD STATION.

plan shown, however, is typical for a station along a waterfront where the floors are exposed. The pipes, as stated, are run under the floors, with risers to the radiators. All lines drain with the flow of steam and are dripped at their ends.

many branches as may be found consistent with economy. This gives smaller pipe sizes, valves and fittings, together with the convenience obtained when making repairs to the system by the valving off of each branch. Full-sized valves are placed in all branches from the mains or

headers and at the heater or wherever necessary to give perfect and interchangeable control of the entire piping system.

The radiation is distributed near windows and particularly near doors as, in this class of work, the air change from opened doors is relatively large. Radiators are installed back of seats where possible, thereby not interfering with the neat appearance of the station. No radiators or piping, except those at the doors, are visible. The efficiency of radiators placed back of seats is somewhat impaired on account of this location, ordinary two-column radiators, 38 ins. high, when thus placed, being assumed as emitting 250 B.T.U. per square foot per hour.

It will be noticed that the supply valves of two adjacent radiators are located between the radiators. The register, which is immediately above this point, is hinged in order to render the valves accessible. Also doors are provided at the ends of seats for facilitating repairs and for giving access to the supply valves at these points.

For this type of installation, the hot water radiator is more suitable. It is of stronger construction and permits the use of a fractional valve at the top of the radiator, which is particularly desirable when radiators are located in such positions; the backs of the seats are usually 4 ft. in height. When steam radiators are used back of seats, the valves may be located at the bottom in which case extension handles are connected to the wheel of each valve, reaching to the top of the seats. The valves are packless in order to insure a minimum of repairs in the confined space.

All of the radiation is 2-column, 38 ins. high, with the exception of that in the toilets where, due to lack of space, wall radiators are installed. The 2-column type is chosen for its greater efficiency. All radiators, as near as possible, are standardized as to the number of columns, sections and height for reasons of appearance and so as to make them interchangeable within the station or at other points on the road. The majority of the radiators shown on the plan contain 88 sq. ft. of radiation each, which is a size of convenient bulk and not likely to be damaged in handling or shipping. The radiators are also arranged in capacity that every other one may be cut out in milder weather. The connections and valves at the radiators are all of the same size and the entire system, therefore, may be quickly and readily installed by the contractor.

Opinions may differ somewhat as to the type of radiation to be installed in baggage rooms, where appearance is not the deciding factor. Pipe coils are rated at 300 B.T.U. per sq. ft. of radiation per hour. Also they do not project so far into the room. While cast-iron radiation takes up less overall space, still pipe coils extend out from the walls for a distance somewhat less than that required by radiators. This is important when one considers their liability to damage due to the handling of baggage. Pipe coils usually sag in time and the hangers are broken, thus decreasing the efficiency through air binding in the pockets formed, and increasing the maintenance. In addition, alterations to a pipe coil are usually necessary if it is to be removed and used at some other point.

In the installation shown, pipe coils could not be used as they could not be provided with supports extending through the sliding doors shown on the plan without interfering with their operation.

In the better class of passenger stations, where discoloration of the walls may be objectionable, some sort of shield should be installed over the radiators. When circular radiators are used, they should be screened over to prevent the public from using them as a receptacle for refuse.

Systems for the Engineer and Contractor

PRACTICAL SUGGESTIONS, WITH FORMS, FOR INCREASING BUSINESS EFFICIENCY.

BY THOMAS BARWICK, C. E.

There seems to be an impression that, as a rule, relatively more master fitters fail than master plumbers and that the losses, when incurred, are greater on steam and hot-water heating contracts than they are on plumbing and similar contract work. This may be caused by a misunderstanding of general business principles; some of the material men have made the remark that they lose more from steam fitters than from those engaged in any similar line.

In a number of cases the heating business is taken up as a side issue by master plumbers who appreciate the fact that no legal or moral requirements are enforced in the heating work alone. Many of the failures that have been recorded are no doubt due to poor business methods. Again, the legitimate master fitter has had to compete with those who are not properly qualified for their work and who have not the experience to make a success of their business.

DEPENDENCE OF CONTRACTORS ON MANUFACTURERS.

Many of the parties who have entered the heating field are more dependent upon others than on their own knowledge and experience; that is, in the exploitation of various products entering into the practice of steam and hot-water heating, the manufacturers have given considerable assistance to those who were not familiar with the conditions, with a view of obtaining sales for their product. Such services, rendered by the manufacturer, are valuable to the contractor and, no doubt in many cases, are conservative, but as is so often the case with those who are inexperienced, they may lead to errors of application through the failure to understand the particular conditions.

The foregoing applies, for instance, to a small contractor who has limited means, but who desires to enter into competition. Very often he depends upon advice that is furnished by the manufacturers which he may or may not understand. In case of his inability to meet the conditions of an installation, he endeavors to fall back on the manufacturer, but as all of the conditions may not be known to the manufacturer, he merely refers to the capacity of his apparatus and not to the conditions under which it is to be used. This is shown by the fact that in 90% of the failures of manufacturers' apparatus to work, it is found that the appliances have been misplaced and the manufacturer, in such a case, absolves himself from all blame.

The contractor who has placed implicit faith in the assistance given him, leads the manufacturer into many difficulties, so that the manufacturer has to keep a service account to take care of the troubles. Such expenses, of course, must be charged to the cost of the wares. These charges, therefore, are paid by the owner and, if eliminated, the cost of the wares would probably be much lower.

POINTS TO REMEMBER IN PREPARING ESTIMATES.

Among the elements that should be thoroughly understood in figuring on contract work are modifications after the contract is signed, designed to benefit the contractor and yet please the owner, the accomplishment of the work in the allotted time as figured in the estimate, the likelihood of delays due to unforeseen conditions, and the state of the market at the time the contract is taken and at the time the work is done. These are some of the main considerations and the allowances made will determine whether or not there is to be a profit on the job.

Other conditions that will affect the amount of profit are such items as the proper supervision of materials and the dispatch in providing them to avoid delay, both in the execution of the contract itself and in the occupation of each workman on the job. In this connection, the manager for a large concern found he could purchase a bill of goods at a special discount of 5% if the materials were

Date._____ Est. No._____ For._____

System._____ At._____

ROOM OR SPACE	EXP.	SIZE L. x W. x H.	CUBIC CONTENTS	GLASS	WALL	ROOF	REQ. H.S.	RATIO	PROP. H.S.	RADIATION	SQUARE FEET 22'	26'	32'	38'	43'	WALL	BOX	VALVES	INDIRECT STACKS	SQUARE FEET H.S.	FLUE	REGISTER	COILS	PIPES HIGH	SIZE PIPES	LINEAL FEET	SQUARE FEET H.S.	REMARKS

PIPE	½	¾	1	1¼	1½	2	2½	3	3½	4	4½	5	6	7	8	10	12	ODD	MISS'E	LIST TOTAL	%	NET COST
Main Steam																						
" "																						
" "																						
" Ret'n.																						
" "																						
" "																						
Risers																						
"																						
Branches																						
"																						
Misc.																						
Total Feet																						
Brass Pipe																						
" Ells																						
" Tees																						
" Union																						
Iron Elbows																						
"																						
R&L. "																						
Red'g. "																						
Flanged "																						
"																						
Tees																						
"																						
Tees Red'g.																						
" "																						
" "																						
" "																						
" Flanged																						
" "																						
Nipples																						
"																						
Unions																						
Flanges																						
Plugs																						

FIG. 2—SECOND PAGE OF ESTIMATING SHEET.

Brought For'd.-

VALVES	½	¾	1	1¼	1½	2	2½	3	3½	4	4½	5	6	7	8	10	12	ODD	MISC.	LIST TOTAL	%	NET
Main Steam																						
" "																						
" Return																						
" "																						
Risers																						
"																						
Power St.																						
" Exh.																						
" Feed																						
" Suct.																						
Check Valves																						
Reducing "																						
Back Press "																						
Misc. Valves																						
" "																						
" "																						
Hangers																						
"																						
Threads																						
Sundry Art.																						
"																						
"																						
"																						
Heaters																						
Tanks																						
"																						
Pumps																						
"																						
Traps																						
"																						
Exh. Head																						
Separator																						
Extractors																						
Misc.																						

Carry Forward

FIG. 3—THIRD PAGE OF ESTIMATING SHEET.

For. _____ Estimate No._____ Date_____
At. _____ System._____ File._____
Estimate to._____

			NET.
	Brought Forward	%	
Boiler			
Casting			
Trimmings			
Damper Reg.			
Misc.			
"			
Boiler Carting			
Foundations			
Settling			
Misc.			
Smoke Conn.			
Misc. Art.			
" "			
" "			
" "			
Blowers			
Fans			
Heaters			
Misc.			
"			
Radiation	45"		
	38"		
	32"		
	26"		
	22"		
	Wall		
	Indirect		
	Box Base		
Coils			
"			
Misc.			
Motors, etc.			
Oil and Waste			
Tool %			
Painting			
Covering			
"			
"			
Freight			
Cartages			
Misc.			
Labor			
"			
Sheet Iron Work			
"			
Carpenter			
Board & Expr.			
Sundries			

NET COST
Business Expense

Price Quoted_____
_____

FIG. 4.—FOURTH PAGE OF ESTIMATING SHEET.

carted from the factory. His firm was equipped with only one truck of two-ton capacity and ten tons were to be carted. The manufacturer had a contract with a large trucking concern at a low rate and the materials could have been delivered by the manufacturer for $70. As the work was progressing rapidly, the materials were needed to keep the force of men busy, but the saving if carted by the contractor's wagon was figured to be $30. As the contractor owned the truck, the manager claimed that he would save all of the cartage as the truck was part of the shop equipment.

The result was very different from that anticipated. The small truck took five loads and about three days' time. Moreover, with one of the loads, owing to delay in travel, it was necessary to take it to the shop, store it over night and reload it in the morning. As the units were heavy, additional help had to be procured to do this work, so that the anticipated saving on the operation was not only wiped out but an expense of $40 additional incurred.

ITEMS THAT COME UNDER BUSINESS EXPENSE.

Some of the questions that arise in the heating business are: what should be classed as business expense, and what is that cost to the contractor? These items can be figured from the amount of business done and the items of general expense, such as rent, clerk hire, stationery, trucking and sundry articles necessary for the general business and not directly chargeable to the contract.

Some years may be better than others and there may be a difference in the chargeable account, but in a majority of cases 10% works out as a safe basis and prudent men add this percentage to the amount of their estimate.

Many contractors do not know what their business costs them; they only know that at the end of the year or at times of stock taking they are ahead or behind, as the case may be. Those who are behind often try hard to obtain work at any price so that they can keep afloat, but at last they may be forced to go to the wall. In the meantime, however, others trying to bid against such competition must choose between doing the work on an unprofitable basis or, perhaps, lose their customers.

This unhealthy competition and the owner who invites it is generally placed in a position to lose money by delay or he may find it hard to make his contractor live up to his obligations.

DESCRIPTION OF FORMS.

As an aid to contractors to obtain more uniform conditions and to make competitive work more stable and fair, the accompanying series of forms have been prepared which, it is hoped, may lead to a better basis for figuring and executing heating work and at the same time simplify the proposition so that more even competitive conditions will obtain.

The first requisite is to arrive at a fairly accurate computation of the sizes of the radiators and from them figure the size of boiler required, pipe work, etc., and to sum up all the items that enter into the cost of the work to be done. For this purpose the forms or estimate sheets shown in Figs. 1-4 are recommended.

These four figures may be arranged as a four-page sheet and contain practically all the items that enter into the composition of a heating apparatus. There is sufficient space in the miscellaneous lines for any items that are not included. The sheets are carefully drawn and permit of estimating jobs of small or considerable size. If desired, the sheets can be arranged as loose leaves and easily filed in book form. This arrangement also permits the estimator to use the sheet in the field for making estimates away from the office. As the items are noted on the sheet it will be an aid to him in securing all of the data and checking the work without waste of time, reserving final computation of costs from the quantities marked under the various items. This method will give the estimator the opportunity of getting lump sum prices from the totals for most of the materials.

In Fig. 1 the arrangement shows the rooms with their exposures, glass, wall, roof or ceiling, etc., from which can be gathered the required amount of radiating surface, according to any of the commonly-used formulas. The place for that quantity is shown, with the number of units it is proposed to use, together with

the actual surfaces and heights of radiators. In this way each of the different heights may be totaled at the bottom so that proper allowance for the different costs can be quickly computed. At the same time the required valves can be added and other data, such as sleeves, plates, etc. The forms provide for similar information in case indirect radiation is used or coils, spaces being left for the sizes of flues and registers for indirect work, and where coils are used, the sizes of same, with the lineal feet of pipe required, etc.

If the plans are already laid out and it is not necessary to refigure all of the spaces, it is easy for the estimator to take off and place under the various sizes the radiators and valves as entered in the different columns.

Fig. 2 would be the reverse side of the general radiation data sheet and, as the arrangement covers most of the materials that enter into the construction, they can easily be taken off from the plan and placed in the proper columns under the sizes and totaled, or separated. Many jobs require treatment, such as the covering of certain pipes and, with the additional spaces provided, these may be separated from the general data, or distinguished in some way so that they may be easily separated. In a similar manner the fittings may be taken off and the items accurately figured or allowances made.

Fig. 3 would be on the opposite side of the sheet forming another page. Here the valves and other constructive details may be arranged in their proper order for easy checking and computation. The additional spaces can be used for articles not mentioned in the sheet, plenty of space being provided for descriptive matter in connection with each item.

Fig. 4 would be the reverse of page 3. On this sheet the totals of cost can be carried forward and items inserted, such as the boilers with their trimmings, smoke pipe, settings and sundries, so that in case of purchasing certain lots in a lump, they may be easily checked. The radiation can be itemized as to the different costs, amounts and discounts, and so on, with other unusual apparatus. The general sundries that make the final items in an estimate, such as labor, cartage, oil, waste, etc., are also arranged in order for easy checking and verification.

The sheet, with the four pages in the order shown, could fold in the center and could be easily secured to a book cover with clips or hooks, or a wider blank margin could be left near the fold line for use with perforated system, or ring binders.

The form shown in Fig. 1 is somewhat limited for large operations and, therefore, it would be of advantage to have additional sheets made in single-leaf form with the same indications as an adjunct, which could be filed with the main sheet.

TOOL AND SUNDRIES ACCOUNTS.

The writer would call attention to the item shown in Fig. 4 as "tool account." This is an item often overlooked by steam fitters, but in many operations tools are lost or broken and, while it is usual to charge them to the workman, they are not always responsible. As new tools have to be purchased in some operations, a certain allowance should be made, especially on large jobs.

Waste, oil, candles and other sundries should be charged and are often charged in the contract shipping lists, but in most cases they are omitted in the estimate sheets. Therefore, all of these items affect the anticipated profit and many jobs run behind on account of these and similar omissions.

As a rule, all materials purchased for a job are billed to that job on the purchase account, and likewise all materials taken from stock should be so charged; therefore, if no allowance is made for the latter item, the anticipated profit at the completion of the work is considerably smaller from this loss. While the contractor may have made savings in his purchases, he is at a loss to know where the leak is at the wind-up. This often occurs and if the cause is looked for among the sundry accounts it will frequently be found there.

With careful estimating the cost should be within 1% or 2% of the estimate and, if care is taken in the purchasing and in the element of time in providing the proper materials ahead for the workmen, it will be found that profit should come very close to that estimated.

The making of estimates as correctly as possible will eliminate many of the losses, but the supervision of the work and the integrity of the workmen will be a still greater adjunct to a profitable business. While it might be well to say something in regard to the superintendence given and the methods of those intrusted with this important work, the treatment of the workmen will be a better theme.

(*To be continued.*)

Intermittent and Continuous Heating With Steam

(*From a discussion at the Annual Convention of the National District Heating Association, Rochester, N. Y.*)

By E. L. WILDER.

There are several considerations involved in this subject as to whether it is more profitable to turn off steam at night or to keep it on continuously. These will have different weights when the question is applied to different situations and the resulting conclusion may not always be the same. There can be no general answer to this question that will apply to all conditions. More is involved than simply the question as to how much steam will be used or how much coal will be burned. In general, the method of operation which uses the least steam will be the most profitable, but this is not necessarily the case.

Let us consider, first, what happens to a room or building which has been heated to a temperature above the surrounding air and the supply of heat is stopped. Heat continues to radiate through the walls at a rate which is proportional to the temperature difference between the inside and outside. The heat will be supplied by the energy which is stored in the walls, floors and the contents and, as these give up their heat, the inside temperature will gradually fall. It is evident that at the end of the period during which the heat has been turned off the average temperature difference between the outside and the inside will be less than it would have been if the heat supply had been left on and the inside temperature maintained at a uniform value. The storage heat, which has been given up during this period must of course be supplied when heat is turned on, so that this quantity does not enter into the economic equation. There is, however, a saving due to the lower average temperature difference.

EFFECT OF COEFFICIENT OF HEAT TRANSMISSION.

Besides this lower average temperature difference there is another factor which affects the amount of heat transmitted. This is the coefficient of heat transmission. It is a fact that the principle resistance to heat transmission through any wall or window of ordinary construction is at the two surfaces, where the heat enters and leaves the wall or window. The surface resistance is affected by the condition of the air which is in contact with this surface. If the air is in motion the heat transmission is faster than if the air is at rest, and a rapid air motion gives a higher coefficient than a slow one.

The formula developed by Grashof is ordinarily used in calculating this factor and, as an illustration, I have calculated the constants of heat transmission for three thicknesses of brick wall and for single glass under two conditions; one for inside air in slow motion and one for inside air at rest:

The values are as follows:

	Inside Air in Slow Motion	Inside Air at Rest	Per Cent. Decrease
8-in. brick wall..	0.411	0.397	3.4
16-in. brick wall..	0.315	0.309	1.9
30-in. brick wall..	0.158	0.154	0.25
Single glass.....	0.97	0.907	6.5

SLOW AIR MOTION WHEN HEAT IS TURNED OFF.

It is evident that the heat transmission is considerably influenced by condition of the air and that this effect decreases

as the wall thickness increases. With the heat turned off there will still be slow motion of the air due to the cooling of that portion of it which is in contact with the outside walls. I believe that we are fully warranted in saying that this air movement will be much slower with the heat supply shut off than with the heat on, whether this heat is supplied by direct radiation or through a hot blast system. The values given are not intended as an accurate measurement of the amount but as an indication of the order of magnitude of the difference in heat transmission, which may reasonably be expected.

Another fact which has a considerable bearing upon this question is that if the building is shut up at night and the steam is not turned off, the temperature is very liable to rise and cause an excessive temperature difference between the inside and the outside. Recording thermometer records taken in factories where steam was not turned off have shown that the temperature may easily rise to 80° and above.

AMOUNT OF RADIATION INSTALLED A FACTOR.

The application of this method of running a heating system depends a great deal upon the rapidity with which heat must be supplied when it is desired to bring the temperature up to normal. When there is only a little more than sufficient radiation to supply the normal heat losses from the building it is evident that if the night temperature be allowed to fall much below the day temperature it will be a very difficult matter to get it back. This means that if this method of operation is to be applied, the heating systems must be designed with some excess capacity. In order to apply this method partially, however, it is only necessary to provide such capacity as is ordinarily considered good practice. For example, during the three coldest winter months, December, January and February, the average temperature (in Rochester, N. Y.) is about 25° F., so that if a heating system is designed for zero weather there will be on the average a 35 per cent. excess heating capacity. During the whole heating season the average temperature is about 45°, so that on the average the heating system, which is designed for zero weather will be over twice as large as is necessary. This gives a capacity which will allow for the intermittent operation of the heating system, except in the very coldest weather.

TEMPERATURE MUST BE MAINTAINED IN CERTAIN INDUSTRIES.

In some industries it is not allowable to drop the temperature below a certain point because of the character of the work. An example of this is the manufacture of shoes, in which patent leather is used. Any decided lowering of temperature will cause the patent leather to crack and it is therefore necessary to maintain practically a uniform temperature at all times. Another example is the grinding of lenses, where a drop in temperature below a certain point will spoil all the work in progress.

The result of observations which I have made on the operation of the heating systems of several factory buildings, which are being heated by central station steam service has led to the conclusion that a saving of from 10 to 30 per cent. may be effected by the method of intermittent heating.

DISCUSSION.

D. S. BOYDEN: Mr. Wilder's statement of the saving by intermittent heating is undoubtedly true under certain conditions, and probably is the result of his observations in factory buildings. The question raised at the last meeting was at what degree of temperature you should shut off the steam, or continue to run it all night? Of course we know that there must be some intermittent heating in our regular conduct of the business; for instance, September and October we may supply heat only two or three days out of a week or month; but it is in settled weather that we are making special reference to intermittent heating, and there is some degree of temperature, and a certain length of time that this low temperature is on that will determine whether it is more profitable to supply steam continuously, or intermittently.

I attempted to make a study with regard to this point in Boston in some of our buildings and found it quite a diffi-

cult task. After consideration I have some to the conclusion that at somewhere about 34° F. average temperature for the day it is cheaper to supply steam continuously, and that the hours of shutting down in order to be effective should be at least four hours for every advance degree average rise in temperature above that.

MR. ORR: Mr. Wilder has arrived at the logical conclusion, so far as factory buildings are concerned, and, no doubt, this will be found true for many other classes of buildings. It has been my observation, however, that it is impossible to induce some consumers to follow this practice, although they are buying on a meter basis and have every incentive to economize. Hotels must be supplied almost continuously during the season and in the latest office buildings steam is turned off only in the mildest weather, Continuous service is advantageous to the heating company as it provides a steady load for the boilers at all hours, and eliminating the early morning peak. But if it can be demonstrated that night heating is a useless waste it is to the interest of the heating company to educate the user to that effect. In short, it does not pay to assume the "We should worry" attitude just because the wasted steam is all paid for. It is always policy to induce your customers to economize whenever such is possible.

A MEMBER: Some tests were run at a certain institution during last winter, and the conclusions derived were that below 25° F. they found it advisable to keep the heat continuously in the building; but when the temperature outside was about 25° they regulated the heat, shutting it off about 4.35 in the evening and turning it on about 5 o'clock in the morning. This method showed a saving of about 22 per cent. The difficulty they found was in bringing the temperature up in the morning whenever they made a little late start. That interfered with the working force; but by the time the students came into the building the rooms were up to 70° temperature.

H. R. WETHERELL: We have always maintained that customers should have regard for the temperature out of doors. Say, that if the average temperature was above 25° or 30° F., it would pay them to shut off the steam, that is, at night in business places open, say, from 7 o'clock in the morning until 6 o'clock at night. If they left the steam on during a period of, say, eleven hours in the daytime, and shut it off during the thirteen-hour period at night, when they do not need it, they would just cut their bill in half. In other words, for the thirteen-hour period at night if the steam is on they would condense as high as 3,000 lbs., whereas at the same temperature during the day for the eleven-hour period they would condense only 2,000 lbs.

I made a test on a theatre building this year, a good-sized building, exposed on three sides, using a combination of indirect and direct heating. They did not want to give us enough space to put in direct radiators, so they kept the radiation down to a minimum, and the manager along in January complained of his bills being high. He came over to see me and I told him that he probably would have to shut the steam off at night. I told him he could make a saving of from 35 to 40 per cent. if he carried out my instructions. I asked him to give me permission to send one of our men to his building and take charge of the regulating of the heat for about a week. He was running a vaudeville show, giving two performances every evening. The result of the complete tests that were taken by my engineer showed that when he left the steam entirely on in the building between 9.15 o'clock at night and 9 or 10 o'clock next morning they condensed between 6,000 and 7,000 lbs. of steam. Of course when it was shut off entirely it did not condense anything; so that shutting off at night meant a saving of 6,000 lbs. in the twenty-four hours. That for thirty days in the month would mean a saving of $90 a month on the heating of the building.

At the same time we were regulating that place we also regulated the temperature in a moving picture theatre owned by the same people so as to make them a saving of $45 a month by shutting off the steam at night. After we had tabulated the results we found and showed them to the manager, he instructed his man to regulate the heat as we had di-

rected. They also have three other moving picture houses in town and we are selling them steam at a flat rate. He says next year he wants to sign up on meter rate for all of them and have them regulated in the same way.

C. H. SPIEHLER: Have you any way of showing what the condensation was for the twenty-four hour period as against the strictly day period with the night cut out?

H. R. WETHERELL: Two or three nights we had it shut off entirely, and it took about three hours the next day to heat the house up to 70°. The most we condensed in those three days including the heating of the building after steam had been off all night was about 18,100 lbs. In the twenty-four hours with the heat on they condensed about 14,000 lbs. At the time that we were regulating it, under our regulation they used between 7,000 and 8,000 lbs. in twenty-four hours, that is by shutting off during the night period.

E. B. TYLER: I would like to ask Mr. Wetherell if he made any tests on dwelling houses with respect to shutting off during the night period?

H. R. WETHERELL: I have never made any tests of that kind with dwellings, but have taken readings morning and night to show customers that they were running more at night than in the day time, and have had them cut their bills down quite a bit.

G. D. BLY: We have had considerable shutting off of steam during the night. In one building that was on a flat rate we shut off the heat regularly from about 10 P. M. to 4 or 5 o'clock in the morning. We put this building on a meter service last winter and the owner himself shut off the heat every night at 5 P. M. when he went home and turned the heat on again at 8 A. M. when he came in. With the temperature down to 22° F. below zero, with the steam shut off at 5 P. M. and turned on at 8 A. M., we never had any complaint.

Data on Intermittent vs. Continuous Heating.

At the request of the convention Mr. Wetherell, of the Central Illinois Light Company, subsequently submitted the following data showing the effects in two theatre buildings under varying conditions:

TESTS ON THEATRE HEATING SYSTEMS WITH CONTINUOUS AND INTERMITTENT HEATING.

HIPPODROME THEATRE.

Date 1914	Time	Meter	Difference	House Temp. Deg.F.	Outside Temp. Deg.F.	Remarks
2-10	9:25 P.M.	1106100	..	74	20	Shut off after first show.
2-10	10:50 P.M.	1106100	0	70	14	Steam off.
2-11	8:30 A.M.	1106100	0	46	8	Turned on steam.
2-11	1:00 P.M.	1107900	1,800	70	6	Steam on.
2-11	9:20 P.M.	1112100	4,200	64	5	Turned off, till after last show.
2-11	10:55 P.M.	1112100	0	64	5	Turned on main and indirects, scrub night. Dampers closed.
2-12	10:00 A.M.	1118500	6,400	62	8	Steam on all night in mains and indirects, stage and dampers closed.
2-12	1:30 P.M.	1120200	1,700	62	8	Steam on, all radiation on.
2-12	9:15 P.M.	1127700	7,500	68	6	Steam on to be left on all night, dampers closed, direct radiation in house and stage off.
2-13	10:00 A.M.	1134500	6,800	60	8	Turned on all radiators, opened dampers.
2-13	1:30 P.M.	1137500	3,000	66	16	Everything on.
2-13	9:40 P.M.	1144300	6,800	74	16	Turned off, closed dampers.
2-14	8:15 A.M.	1144300	0	56	14	Turned on all radiation, opened dampers.
2-14	10:00 A.M.	1145000	0,700	62	16	
2-14	1:30 P.M.	1147000	2,000	66	22	Lobby doors open, one exit door open 2 inches, north side.
2-14	9:05 P.M.			70	16	Shut off all direct radiation in auditorium.
2-14	10:50 P.M.	1153600	6,600	70	12	Shut off everything but main, closed dampers, scrub stage.
2-15	8:15 A.M.	1154200	600	58	10	Turned on everything, opened dampers.
2-15	10:15 A.M.	1155400	1,200	62	10	Cleaned out seal; holding water.

Date 1914	Time	Meter	Difference	House Temp. Deg.F.	Outside Temp. Deg.F.	Remarks
2-15	4:00 P.M.	1159200	3,800	66	20	Cold wind blowing through house from rigging loft over stage.
2-15	9:15 P.M.			72	11	Shut off directs in auditorium, closed dampers.
2-15	11:10 P.M.	1162600	3,400	70	9	Shut off everything but main; scrub night.
2-16	8:45 A.M.	1165400	2,800	58	4	Turned on everything, opened dampers.
2-16	10:40 P.M.	1167100	1,700	64	14	Back door open; taking in show; stage cold.
2-16	9:00 P.M.			70	16	
2-16	10:15 P.M.	1176100	9,000	70	17	Shut off everything; house valve.
2-17	7:50 A.M.	1176100	0	58	22	Turned on.
2-17	10:00 A.M.	1177100	1,000	64	32	Asbestos curtain down.
2-17	1:30 P.M.	1180200	3,100	66	42	Front doors open, air blowing through house.
2-17	9:00 P.M.	1183000	2,800	72	28	Closed dampers and wall rad. in auditorium and stage; stage cold.
2-17	10:00 P.M.	1183600	600	70	27	Closed house valve; stage cold.
2-18	8:00 A.M.	1183600	0	60	26	Opened house valve.
2-18	1:30 P.M.	1187100	3,500	68	28	Everything on.
2-18	9:10 P.M.	1183400	6,300	72	25	Shut house valve.
2-18	10:45 P.M.	1193400	0	68	25	After last show.
2-19	9:00 A.M.	1193400	0	58	18	Opened house valve, everything on; taking in show.
				DUCHESS THEATRE.		
2-11	10:00 P.M.	165000		70	5	Turned steam off for the night.
2-12	8:30 A.M.	165000	0	50	8	Turned steam on.
2-12	10:30 P.M.	168400	3,400	68	6	Turned steam off for the night.
2-13	8:30 A.M.	170300	1,900	58	5	Turned steam on at 4;00 A. M. by painters.
2-13	10:10 P.M.	173100	2,800	68	8	Turned steam off for the night.
2-14	7:40 A.M.	173100	0	58	10	Turned steam on.
2-14	10:15 P.M.	176400	3,300	70	13	Turned steam off for the night.
2-15	7:00 A.M.	176400	0	60	7	Turned steam on.
2-15	9:50 P M.	179700	3,300	70	10	Turned steam off for the night.
2-16	6:00 A.M.	179700	0	58	2	Turned steam on.
2-16	10:00 P.M.	183700	4,000	70	17	Turned steam off for the night.
2-17	6:45 A.M.	183700	0	60	20	Turned steam on.
2-17	9:45 P.M.	186100	2,400	68	28	Turned steam off for the night.
2-18	7:45 A M.	186100	0	60	26	Turned steam on.
2-18	9:45 P.M.	188600	2,500	68	25	Turned steam off for the night.
2-19	7:30 A.M.	188600	0	60	22	Turned steam on.

Relative Merits of Centrifugal and Reciprocating Pumps

By A. C. ROGERS.

(From a discussion at the annual meeting of the National District Heating Association, Rochester, N. Y.)

The fundamental principle governing the selection of a pump should be found by a complete analysis of what that pump has to do. Under that head will come not only the work to be done but the amount of money that is allowable for its installation, and also the available space in which to install it.

The centrifugal pump is not a recent addition to our mechanical equipment, but it has made wonderful strides in the last five years. We are not yet, however, at the limit of what the centrifugal pump will do. I believe there is on record on high duty work a centrifugal pump of eight stages.

Now there is another quality in regard to the pumps, and that is the head and capacity. It is a well known fact that we can get good work out of a reciprocating pump; but we are all to blame for one inevitable fault of the reciprocating pump, namely, that we underestimate the size of pump we need, either due to space or money; and when you do that you will infallibly bump up against an increased cost for maintenance, the valves will be hammered out, and the packing will give way, and the result is that it leaves somewhat of a bad taste.

On the other hand, I have knowledge of a centrifugal pump that was adequate

to do the work, but on account of cost it was built of the wrong material. The cause of the cost, the impeller, was ordered to be constructed of cast iron, and the result was that the action of the water both in erosive effect and through the chemical constituents in the water soon destroyed the impeller, putting the owner to the expense of having to replace it.

I have also the advantage of a record of some western engineers reporting on a large water system for a municipality. The pump was about 12,000,000 gallons capacity, and the engineers were given the commission of rendering their reports as to whether it should be a centrifugal pump, or reciprocating. After some trials they reported in favor of the reciprocating pump. This pump was 12,000,000 gallons capacity, with somewhere about 80 lbs. static head and gauge pressure, which is a little higher and larger capacity than we generally figure on in a power house; but it is well to remember some of the salient points of their discussion.

One centrifugal pump manufacturer suggested the idea that they could run on high and low pressures. This particular place had a dual system. I presume that they had high pressure on large buildings and fire service, and a low pressure system for residence work. It was intermittent work; in other words, it was a stand-pipe, the pump taking the peak load. A centrifugal pump was advocated with the idea that it would work on either high or low service. The cost of maintenance in this report was estimated from several sources at 3½ per cent. for centrifugal pumps and 1½ per cent. for reciprocating pumps.

In our own city of Toledo, Ohio, we have had for six years seven centrifugal pumps operating on our hot water heating system, and they have worked entirely successfully. They are of the capacity of 2,000 gallons per minute, with a maximum head of 75 lbs. gauge pressure, single stage. Some of them are turbine, but the majority are of the —— pattern. They have not only done their work satisfactorily, but they have reversed the condition on the system, and eliminated the pulsation due to the action of the reciprocating pumps that we previously had. They also have an advantake of smaller floor space. We have one pump that is taking less floor space than the three reciprocating pumps that we had previously in use.

It is not fair to indiscriminately condemn either class of pumps. I have been in a great many power houses where the action of the reciprocating pump was not brought up to its maximum development simply because of poor judgment in its use. It is by no means rare enough to surprise one to go into a boiler room and see the fireman speed his pump up to 160 ft. per minute, jam water into the boiler up to the top of the glass, and then go over and sit down, after shutting the pump down. I know of reciprocating pumps that have been speeded up like a regulator to supply water from the boiler to the boiler as it was needed, practically keeping a constant gauge, practically no attention being given to the pump throughout the year except to tighten the packing of a gland somewhat.

On the other hand, I know of a case of a centrifugal pump in which due to several causes inimical to the pump they have replaced the entire runway in three months.

The day has not yet come where one may say that either pump will displace the other; but it is unquestionably the fact that both pumps have admirable qualities, and that each is peculiarly fitted for certain lines of usefulness as against the other.

Before closing I want to mention that I think the proper action of a centrifugal pump and the best results therefrom will be obtained when we approach the idea of the steam turbine of today; in other words, the steam turbine economy is practically in line with the rotating speed.

I had an experience with a centrifugal pump not long ago which was working on a static head of about 80 lbs. gauge pressure running only 850 R.P.M. My own experience while not infallible, tells me that this is too slow. Our pumps on our heating system run 1850 to 2600 R.P.M., and I think somewhere around that is an advantageous speed to the operation and also the maintenance of your equipment.

Another thing to remember that as to the material with which you construct

the pump everything ought to be up to a quality standard that will stand wear and tear, and that you should consider not only the question of speed and mechanical duty of the pump, but also the material you are handling.

D. S. BOYDEN: The flexibility of the centrifugal pump has appealed to me for several years. There is one point that I would like information on, if I can do so without exposing too much ignorance of hot water heating. A centrifugal pump may be designed for almost any line of operation. The characteristics of the first of these pumps made were that with a reduction in the terminal pressure there was an inverse increase in the amount of foot pounds work performed by the pump which resulted in overloading the motor end.

It is not clear to me what the characteristic of a pump should be for a hot water system; but it does occur to me that there is a possibility that if you want to handle four times the amount of foot pounds, you can over-size your pump with a motor and get your increased capacity. Yet it may be that the hot water heating system would rather guard against such an excess in capacity due to a drop in the static head by increasing the temperature of the outgoing supply. I wish that some one who has had experience in the use of centrifugal pumps on the hot water distributing system would outline the proper characteristics for a pump on such service.

J. P. HECHT: It seems to me that that depends entirely upon your requirements. If you wish to put a large turbine or a large motor on your pump so as to take care of the increased duties of the pump as your pressure falls; and if you wish to increase the volume of water circulating through your heating system when the pressure has decreased, why, that is the kind of pump to buy. We have both types, and we purposely put in one type or the other according to our service requirements.

A. C. ROGERS: I wish to state in regard to Mr. Boyden's query that in taking up the centrifugal pump question or the heating system at Toledo, we considered the largest element of efficiency over the longest period of time; and while these pumps worked at 75 lbs. maximum, if the characteristic curve of efficiency was at its peak, say 65 lbs., gauge pressure, our pump could operate the longest time in that period. Now the efficiency of the centrifugal pump you are all acquainted with; but it drops off from that peak reasonably rapid either way. In any particular case we try to maintain a steady pressure, whatever it is, and we have about 15 or 20 centrifugal pumps, nearly all of them steam turbine driven. We have a governor that has a revolution control and comes with the pump. We also installed in addition to that a pressure control, both operating on the steam inlet to the prime mover, the result being that we get a very satisfactory curve of pressure at the outlet of the pump.

H. A. WOODWORTH: We have a hot water system in the northern part of the city of Indianapolis, with about 400,000 sq. ft. of radiation. We had a large reciprocating pump, but replaced it with a centrifugal motor-driven pump, the idea being at the time that we would have to increase our pipe line capacity on account of the reciprocating pump not being able to take care of the flow. After the centrifugal pump was installed we circulated the same amount of water but find that we have a better differential at the end of our line, and it has eliminated practically all of our troubles without having to change the pipe line. Our repairs as compared with the reciprocating pump are about five to one in favor of the centrifugal pump. We have had practically no trouble whatever with it, since its installation, the results have been entirely satisfactory, and our capacity has been increased through its use 15 to 20 per cent. I might add that the old reciprocating pump cost $19,500; the new centrifugal pump cost $1,600.

J. P. HECHTS: I am surprised that there should be so much doubt in Mr. Rogers' mind as to the advisability of using centrifugal in preference to reciprocating pumps. I have in mind the kind of trouble which he has mentioned and which exists in both types of pumps; but it is a well known fact that any mechanical equipment which is not properly installed for the service for which it will be used will give trouble, and its maintenance will be high. But my ex-

perience has been that centrifugal pumps for me on hot water heating systems are very much more economical so far as maintenance is concerned. There was a time when we had some doubt about the steam economy; but we feel satisfied that over the range of speeds at which we operate centrifugal pumps are more economical so far as steam consumption is concerned. It is possible in most cases to obtain a reciprocating pump which will give better test results as far as steam economy is concerned than a centrifugal pump; but in the long run over a period of years it is impossible to maintain a reciprocating pump in such condition that the steam economy will average better than on the turbine driven centrifugal pump.

D. S. BOYDEN: Let me illustrate the point I want to get at. Let us assume a constant speed positive displacement pump in a particular plant where you anticipate your peak load by raising the temperature of the water and reducing the circulation; now the radiators are being opened on the system everywhere, what do you want? Do you want the pump to maintain the same circulation or do you speed it up? What is the actual running condition in a hot water plant with a drop in outside temperature coming on under such conditions?

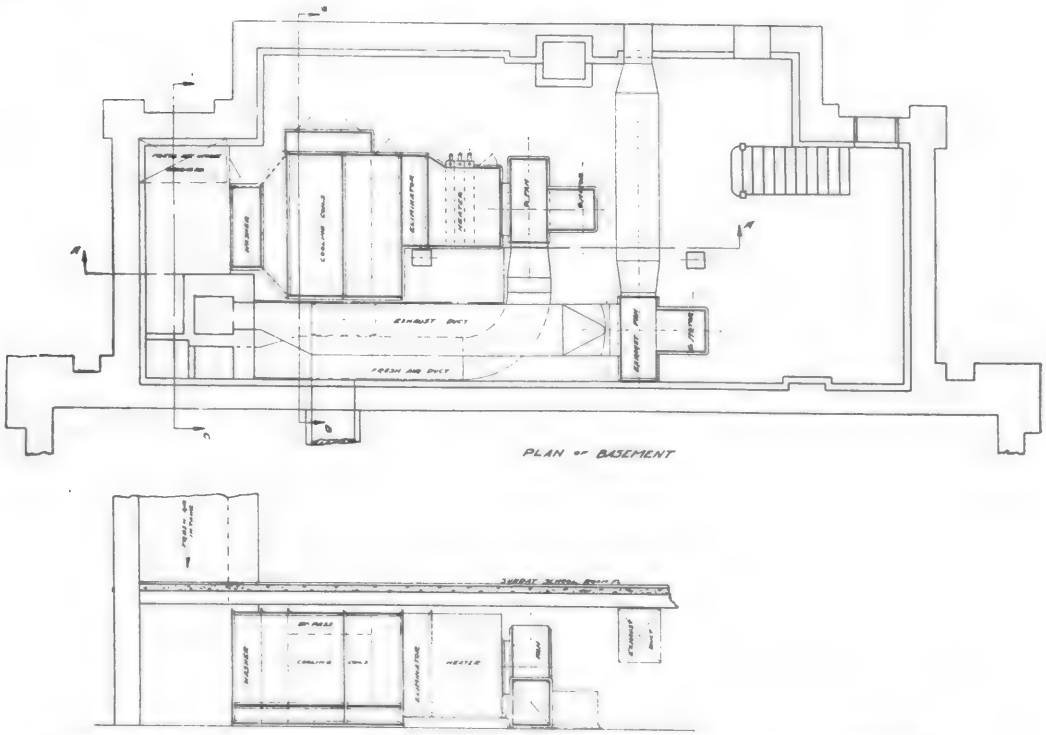
A. C. ROGERS: The operation of the Toledo (Ohio) heating system is based on the service to the houses. That service is considered to be given when we put the temperature into the house. At a hearing before the Public Utilities Commission at Columbus, it was standardized as 30° drop in temperature in passing through the system of any building. Now we find we have a variable that will follow the temperature, and in order to give results from various losses, both the line loss and the house loss, if you have a certain circulation in your system you will have a variable drop on your line as recorded at the station.

It has also been our experience that while the temperature of the outgoing water is maintained rigidly from the schedule due to any atmospheric temperature, we had to vary the circulation of the water to take care of a reasonable range of temperature drop for operation and station economy. It has been our experience that if we can hold the drop between 20° and 30° we get the most economical point at the station.

That means that if it warms up and we get below 20°, we slow the water down and lose more heat through less water going through the house; and if the temperature drops we speed up our circulation, because we find that drop will go above 30° and by speeding it up we will lose a certain amount of heat through more water, and therefore reduce the drop.

We have three stations on our system, and while they all operate in parallel ordinarily, we have valves by which we can divide the system into three districts, and isolate them to the respective stations. The pump is called upon to do a peculiar duty, for the reason that when there is more than one pump or unit operating on the same line, there is a hydraulic wave as you might call it flowing through the system that will cause one pump to pump as against the others and therefore we isolate one of those systems by shutting off the valve.

We have found that in the month of January the general average for the whole of that month was 40°; for the month of February, with almost the same atmospheric temperature as the general average, we speed up the temperature and get a drop of 20°. We put out 16 per cent. more water, with the result of getting 50 per cent. less drop. That shows the economy there; and as I say, we run our steam circulated entirely from the station operation plant, but we put the temperature out from the standpoint of our contract with the consumer.

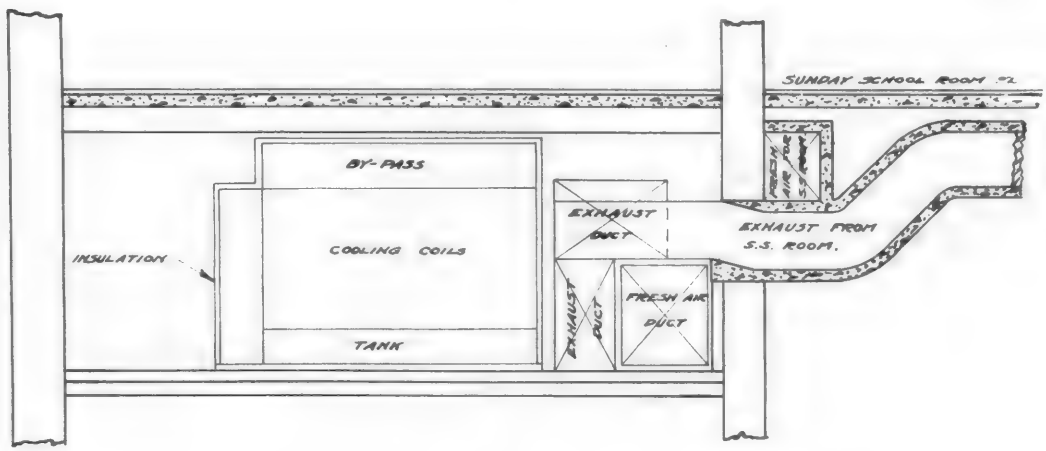


PLAN OF BASEMENT AND SECTION ON A-A, SHOWING ARRANGEMENT OF COOLING PLANT FOR TEXAS CHURCH.

A Cool Church in a Warm Climate.

In Texas the temperature outdoors sometimes runs up to as high as 110° F. Yet there is a church building in Orange, Texas, where the indoor temperature can always be kept down to 75° F. or lower, with a relative humidity of approximately 50% at a point 6 ft. from the floor.

The Lutcher Memorial Church is a handsome stone structure and although not large, according to modern ideas, is of fair size for a small city, while the climate is such that cooling apparatus is very much desired. In this case the cooling apparatus is located in a separate building at the rear. It consists of a carbon dioxide ice-making

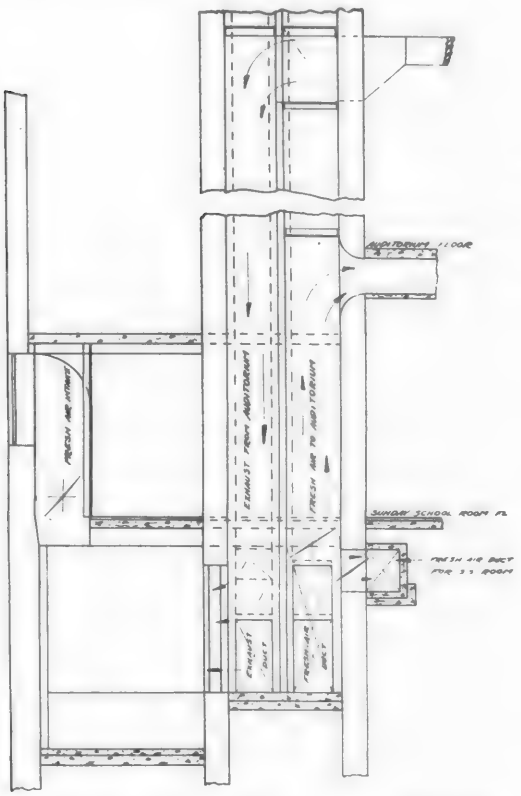


SECTION B-B.

SECTION ON B-B OF COOLING PLANT FOR TEXAS CHURCH.

machine similar to those used for cold storage warehouses. The gas expands directly into the cooling chamber. This does away with brine and with the troubles due to ammonia gas.

The system ventilates and cools the auditorium and Sunday school room. The cooled air is forced into the church through ventilators under the seats at a rate that will change all the air in the church in less than ten minutes.



SECTION ON LINE C-C, OF COOLING PLANT FOR TEXAS CHURCH.

The fresh air intake is at the top of the building. The fresh air duct goes direct to the basement, where the apparatus is located. The air first goes through a Sturtevant air washer of 14,000 cu. ft. capacity. This particular washer is specially designed, cooling coils being placed between the spray and the eliminators. Heater coils for use in the winter time come next and then comes the supply fan. This fresh air fan is a Sturtevant motor-driven multivane, delivering 14,000 cu. ft. per minute. The apparatus either takes air from the outside or recirculates from the inside. The system was designed and installed by the B. F. Sturtevant Co., Boston, Mass.

Simple Rules for Measuring Radiation.

In the course of the hearings before the Indiana Public Service Commission on the subject of rates for hot-water heating service from a central station, a simple method of measuring radiation was presented by Byron T. Gifford, chief engineer for the American Public Utilities Co., who was upon the witness stand. It was stated that under the draft as presented, a man who has a poorly-constructed house or who does not take proper precautions against the admission of cold air, will be obliged to pay more, while the man who builds a well-constructed house and who goes to the trouble of having his windows well fitted and equipped with weather strips and who puts up storm doors, will be rewarded with somewhat lower cost per year. The rules as presented by Mr. Gifford are as follows:

1. Obtain the length, breadth and height in feet and multiply these amounts together, which gives the cubic contents of the room.

2. Obtain the number of square feet of exposed wall (the part of a room which adjoins any unheated space).

3. Obtain the number of square feet of windows and doors on exposed walls or ceilings.

4. Multiply the cubic content of the room (in cubic feet) by 1.6. This will give the heat units required to heat the air in the room.

5. Multiply the area of exposed wall (in square feet) by the number found in the attached table (directions for finding this number are given with the table). This will give the number of heat units required to overcome the cooling effect of the walls.

6. Multiply the area of windows and doors (in square feet) by the number found in the attached table. This will give the number of heat units required to overcome the cooling effect of the openings.

7. After you have obtained the heat units required in Paragraphs 4, 5 and 6, add these together and divide this total by 165, which will give the number of square feet of direct radiation required for the room.

8. In no case will a part of a dwelling or building be heated and charge made for that part only. In such case the charge will be based on the radiation required for the entire dwelling or building. Any room or space having an opening which may communicate with the room or space to be heated must be included in the measurement for space heated whether radiation be installed or not in such room or space, provided, however, that attics which are used for storage purposes only shall not be considered as space to be heated.

RULES AND REGULATIONS.

In addition to these rules for figuring radiation, Mr. Gifford presented a draft of sixteen rules and regulations bearing on the obligations of the central heating company. Among them is the provision that the company must maintain 185° of heat in the water at delivery at the consumer's premises when the weather is at zero, and can drop it one degree in temperature for each degree rise in outside temperature.

TABLE FOR ESTIMATING RADIATION.

Style of wall or opening—	Temperature Required in Room—Deg. F.–				
	50	60	65	70	75
Single window, tight	67	71	75	86	98
Single window, average	73	79	86	98	110
Single window, loose	85	92	98	110	128
Single window, stripped (metal strips)	58	62	66	77	89
Single window, skylight	63	68	73	83	94
Double window (storm)	42	46	51	59	66
Plate glass set tight	43	47	52	50	67
Single door	34	37	40	45	51
Single door stripped (metal strips)	24	26	28	32	26
Storm doors	30	33	36	41	47
8-inch brick wall	19	21	22	25	28
12-inch brick wall	13	16	18	21	23
16-inch brick wall	10	12	15	18	20
12-inch stone wall	28	29	31	34	37
12-inch brick with air space	11	14	16	19	21
16-inch brick with air space	9	11	12	15	18
20-inch brick with air space	8	9	10	13	15
Average frame wall	24	25	26	28	31
Average frame wall with paper	22	23	24	26	28
Poorly constructed frame wall	27	28	28	32	36
Lath and plaster partition	25	27	28	32	36

In answer to an inquiry as to whether the rule should not apply the other way, also—that for each degree of drop in outside temperature below zero there should be one degree increase from 185° water heat, Mr. Gifford thought actual operation would care for this and for heavy winds in very cold weather, but he said the company could agree to that up to the limit of heating the water to 207° at the plant. This would provide for one degree of temperature of the water for each degree below zero down to 17° below zero.

Mr. Gifford figures a loss of 5° of heat in distribution in the Indianapolis plant. His rules also provide that consumers shall put in a temperature control device.

On the left of the table is shown the style of wall opening. Opposite each item is the number to multiply by for various required room temperatures. For example: The wall is an average frame wall, and the temperature desired in the room is 70°. Find "average frame wall" on left-hand side of the table, follow this item to the right until you come to the column of 70°. The number there is 28, which is the number by which to multiply the exposed wall.

Elimination of Noises in Ventilating Systems.

DISCUSSION OF MR. PRYOR'S PAPER, PUBLISHED IN AUGUST ISSUE.

PROF. JOHN R. ALLEN: As far as the reduction of vibration is concerned, my experience in putting rotating machinery on the upper floors of buildings, particularly where there is concrete construction, is that the more rigidly you bolt or fasten the machinery to the building structure, the less vibration you will have. I have had some experience with fans and motor generator sets where we had a great deal of trouble with vibration. In one case, the motor generator set was placed on a steel frame about 4 ft. above the floor and on that steel frame there were rubber buffers about 1 in. thick. On top of that was the motor generator set. We had great difficulty with vibration. I took out the rubber and filled the steel frame in part with concrete and made it absolutely part of the building. We had no more trouble. My own experience is that an elastic material tends to accentuate the vibration in many cases. One thing to be always avoided is an overhanging end which may come into synchronism with the rotating machinery itself. The matter of noise is another question.

J. IRVINE LYLE: I think Prof. Allen would have gotten the same results with his motor generator set if he had put in concrete and

had insulated it from the building. There is the thing that eliminates vibration. He put in a heavy block of concrete and tied it into the building. He was using the whole weight of the building.

H. M. HART: The author made a point of the vibration of the air and in one case he substituted a centrifugal fan for a propeller fan, thus eliminating the noise. Now is it not true that he was running his propeller fan at too high a peripheral velocity and as a result of the change he obtained a fan operating at a lower velocity which reduced the vibration but under different conditions entirely? The fan noise, it seems to me, was due to the vibration of the air in the duct work. In another case the author mentions an instance where he changed the location of a propeller fan to reduce the noise.

R. W. PRYOR, JR.: I would like to state another experience that has just occurred to me. On the top of a hotel I had a 120-in. housed fan exhausting air and operating at ¾-oz. pressure. The engineer with whom I was associated on that job concluded that he would bolt it to the arch of the roof which was of the usual construction of reinforced concrete. The fan made a rumbling noise that was objectionable to those sleeping below, and I suggested that we place the fan upon a slab of concrete mounted on cork. This was done, and while it did not entirely correct the trouble, it reduced it to such an extent that no further objections were made.

A MEMBER: What was the thickness of the cork?

MR. PRYOR: Two inches. In response to Mr. Hart I would state that the peripheral speed of the wheels was changed on those two installations. In one case we had a 36-in. propeller wheel making 600 R.P.M., which would give a peripheral velocity of about 4,000 ft. per minute. The substituted fans were 80-in. housed fans and had wheels in them approixmately 5 ft. in diameter. We were handling more air, according to the tests. In the case of the propeller wheels the speed was cut down to 400 R.P.M. which reduced the noise but did not give enough air for ventilation, as you will find mentioned in the paper.

MR. HART: In the case of the 36-in. fan running at 600 R.P.M. you simply changed the location of the outfit and still maintained it at the same speed?

MR. PRYOR: Yes. That particular installation was in an open attic space. There was an ante room in front of this hall which opened also into this attic space. The wheel was located so that it was drawing its air from both the ante room and the hall. It was rearranged so that no ventilation was given to the ante room, simply drawing air from part of the attic space directly over the hall. To my mind, it was not supported as substantially in the second instance as it was in the first.

PRESIDENT LEWIS: I know of some buildings in which all the ribs are lined with felt, which seems to give good results. We know that they erect sounding boards behind the fans in order to distribute the sound. Is it not possible that we will be able to erect some sort of absorption board that will absorb some of this sound vibration?

PROF. JOHN R. ALLEN: It is a question of synchronism. There may be something surrounding the fan which gets in dissynchronism with the rotation of the fan. I remember a case of synchronism in a Corliss engine flywheel. When the engine was running at a certain speed the flywheel struck the sides of the wheelbed, causing a deflection of over 1½ ins. in a 20-ft. wheel. By changing the speed of the wheel two revolutions it entirely corrected the difficulty.

THOMAS TAIT: This noise matter is interesting to me at the present time for the reason that I have a moving picture theatre in which I am installing a No. 9 Sirocco multivane fan. I put two 12-in. I-beams across from wall to wall, the fan being practically in the center of the attic space. It really presents a splendid opportunity for the drum effect that we have been talking about. That is one reason why I asked about the thickness of the cork. I had a wooden platform made to rest on the I-beams which are set 4 ft. apart. Between the bottom of the platform and the top of the I-beams I have placed 2 in. of cork and 1 in. of cork between the wood platform and the bottom of the fan. The fan has not been operated as yet, so I cannot say anything about what the effect will be.

SECRETARY J. J. BLACKMORE: It seems that there are four possible causes of noise in the working of a power fan ventilating apparatus. First: Vibration, which undoubtedly can be prevented by care in the setting of the fan. Second: The fan itself, which may be due to defective construction, or to the set of the blades in the fan or to overspeeding. Third: The noise due to vibration which may be set up in the air itself, similar to that by which sound is produced in the pipes of an organ. In connection with this there may be also a transference of sound from the fan to a considerable distance in the ducts where it may be liberated by a deflection in its course or by a separation in the duct. Fourth: Noise due to friction of the air traveling through the ducts when being deflected around the turns or due to roughness in the joints on the inside of the ducts. Each one of these possible causes requires special investigation.

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AN ANNOUNCEMENT made by the Utilities Commission of Indiana, in connection with its investigation of the central heating situation in Indianapolis, is not only interesting to heating men generally, but is one that may have a far-reaching effect on the methods followed in district heating. The announcement is that the commission will not confine itself to fixing a rate to be charged for heat, but will also fix the standard for service and the method of measuring the radiation.

The immediate cause of the decision is a notice sent out by one of the heating companies to its patrons that in future the rates would be based on the amount of radiation required instead of the radiation installed. This is the well-known "ready-to-serve" method of charging advocated in Gifford's "Central Station Heating," in which the author assumed, as an example, a building that uses heat only six hours a day, but which has its place on the line and requires the capacity both in the mains and at the heating station, to supply its maximum demand. The heating company must be ready to serve this building at any time it requires service. In return for that required condition, the heating company only receives pay for six hours' service, while the building using heat for eighteen hours pays the company three times the revenue paid by the other building. By this and other illustrations it was shown that a rate based on the number of pounds condensed is far from equitable.

AT THE same time, the difficulty of a commission's attempting to lay down definite rules for measuring the required radiation in a building are apparent. As one speaker put it, if commissions are going into the question of the amount of radiation installed, they must also determine, in a hot water heating system, the degree of heat to which the water must be raised, the size of the mains and pressures, and the rapidity of circulation. Moreover, the commissions must take into consideration the character of each house, as houses having certain exposures must have more heat. The latter statement brought forth a set of rules for measuring radiation that are reproduced in full on another page of this issue. The rules are especially applicable for residence work and the comments passed upon them at the hearings leads to the belief that they may be adopted by the Indiana commission as its basis for estimating required radiation under its new ruling.

COMMENCING with the December issue, the publication of the monthly weather charts for New York, Boston, Pittsburgh, Chicago and St. Louis, will be resumed. This will be the ninth year in which the weather records for the cities named have appeared regularly in chart form in our columns.

THE CONSULTING ENGINEER

The Consulting Engineer" is prepared to reply, in this department, to any questions which our readers may ask regarding problems connected with the design and installation of mechanical equipments of buildings.

39—Heating Problem for a Group of Buildings.

QUESTION: I am working upon a heating system for an institution which will have seven or eight cottages (1,500 sq. ft. each) and a number of administration buildings. The distance from the power plant to the farthest building is 4,000 ft. I am planning to use a vacuum exhaust steam heating system to deliver steam to the buildings and hot water generators to operate a supplementary gravity hot water heating system. The generators, it is planned, are to be provided with thermostatic control valves so that the temperature of the water may be varied according to the weather.

Will the above-described combination steam and hot water heating system, if properly installed, give practically as good results as a steam heating system alone, with each radiator thermostatically controlled? Do you know of any successful combination systems?

ANSWER: As far as the design of a heating system that will work satisfactorily is concerned, there is no difficulty. As to its being the best method from the standpoint of investment and cost of operation, that is a different matter. As the use of exhaust steam is mentioned, it is presumed the operation of engines for power is contemplated. This precludes the use of high pressure steam in the pipes.

In a plant of this character, the power load, except for a few hours in the day, is generally less than the heating requirements. The use of an auxiliary hot water system such as that described would entail expense in radiation and mains, due to the low water temperatures and gravity circulation, without any attendant increase in economical operation. Many plants have been designed to utilize the exhaust steam in the nearby buildings only, and high pressure steam for buildings at a distance. With this arrangement, however, when the peak power load occurs in mild weather, some exhaust is liable to be wasted, as all the buildings are not connected for its use and it cannot, therefore, be distributed to the entire group.

A satisfactory system, from the standpoint of first cost and economy of operation, would be forced hot water. By the use of two heaters in the power house, one for high pressure steam with gravity return to the boilers and the other an exhaust steam heater to be supplied from the engine, the cost will be reduced as compared with the use of separate generators in each building.

The loss by radiation with ample pumpage through the water mains will be somewhat less than for vacuum steam and the entire plant may be controlled from the power house, especially if separate small returns from each building or groups of buildings are used. The two heaters will give a maximum of economy for either the use of live steam, by eliminating the condensation problem, or for the use of exhaust steam, as the back pressures can be eliminated. In addition, if the engine load is of sufficient magnitude, vacuum may be carried by use of a condenser, and possibly, a cooling tower. With this arrangement, the exhaust may be used under a partial vacuum for heating, if desired, and the condensing capacity of the heating system utilized. If the exhaust steam was inadequate, high pumpage could be used and the hot water mains reduced in size, diminishing the radiation losses accordingly.

Due to more rapid circulation and higher temperatures with the hot water system, the installations in the separate buildings would compare favorably in cost with a vacuum steam heating system. Only at such times as the exhaust steam was in excess of the heating requirements would the pumpage be a charge and then only to the extent of live steam operation, as the heat from the mechanical work and friction is returned to the water.

The writer believes a combination system such as you describe was installed at the West Point Military Academy by Henry C. Meyer some years ago and, as already stated, there is no reason why satisfactory heating results cannot be obtained with this method.

Separate Contract Decisions in Pennsylvania.

Further reports of decisions in connection with the separation of contracts for heating, plumbing and electrical work in Pennsylvania, are made by the joint conference committee

of the Pennsylvania Master Plumbers, Master Steam and Hot Water Fitters and Ventilating and Electrical Trades Associations. It is stated that the case in Erie, Pa., involving the validity of the act of May 1, 1913, separating plumbing, heating, ventilating and electrical work from the general contract on public buildings has been upheld by the lower courts in that city. The Master Plumbers' Association applied for and secured an injunction restraining the mayor of Erie from signing a contract awarded to a construction company for completing the third floor of the City Hall building, involving an expenditure of about $20,000, because the contract was awarded in bulk. In the hearing that followed the court overruled the contention of the city that a later act of the Assembly pertaining to third-class cities repealed certain portions of the separate contract law. In conclusion, the court said:

"The city, in our opinion, was not justified in awarding the contract as a whole, because of the failure of parties to submit separate bids for the plumbing, etc., because the city had made no efforts to get separate bids for such plumbing, etc., and, further, because the statute not only requires separate bids, but requires that the contract be awarded for the same to the lowest responsible bidder for each of said branches of the work. It would seem that under said act of Assembly, the bids for work upon public buildings can only be submitted separately, as the statute provides, and that contracts for each branch of the work should be let separately, even though in the opinion of the city authorities, more advantageous bids for such work might be obtained by receiving bids therefor as a whole, instead of separately."

The attorneys for the City of Erie have filed notice of an appeal to the Supreme Court.

In case of the electrical work for the new high school building at Lansdowne, Pa., originally included in the general or builders' specifications and so advertised, this work will, as a result of the committee's efforts, be separated, re-advertised and awarded in accordance with this law.

American Society of Mechanical Engineers.

The nominating committee of the American Society of Mechanical Engineers has presented the following ticket for officers of the society for 1915: For president, Dr. John A. Brashear, Pittsburgh; for vice-presidents, Henry Hess, Philadelphia; George W. Dickie, San Francisco, and James E. Sague, Poughkeepsie, N. Y.; for managers, Charles T. Main, Boston; Spencer Miller, New York and Max Tolz, St. Paul; and to fill the unexpired term of the late Alfred Noble, Morris L. Cooke, Philadelphia; for treasurer, William H. Wiley, New York.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

New York Chapter Discusses Relation of Heating Buildings to Power Plants.

A live topic for discussion, which brought out much valuable information, served to make the opening meeting for the season of the New York Chapter a notable event. It was held October 19 in the Engineering Societies Building. The subject for the evening was "The Relation of Heating Buildings to Power Plants," the principal speaker being Reginald Pelham Bolton. It was the first meeting to be presided over by President Walter S. Timmis, the new president of the chapter, and the influence of his administration was reflected in the meeting itself and also in the snappy programme for the winter that has been issued under his direction.

Following the transaction of routine business Mr. Timmis introduced Mr. Bolton, at the same time expressing his pleasure in having him speak to so interesting a subject.

Mr. Bolton introduced his subject by saying that the present availability of fuels and the general use of steam for heating purposes has led to the adoption of that medium to a much greater extent than any other means or method and has brought about, to an undue extent, a dependence upon steam for general heating purposes. He believed that we have devoted too little attention to the study of other means and methods of heat utilization and distribution and certainly we have not devoted as much attention to the analysis of operating conditions and costs as we have to the design and proportioning of apparatus and systems.

HEATING SERVICE NOT CONTINUOUS.

Mr. Bolton showed that the service involved in heating buildings, for instance, in New York City is not continuous. The extent of the duty as to time is about 57% of the year, or 5,040 hours out of 8,760. This period normally extends from the early part of October to the first or second week in May. In our home region its commencement is liable to be deferred a couple of weeks, as is the case this year, and may, on the other hand, overlap the normal period of rise of temperature above 76° F. at the termination of the season.

The requirements vary from hour to hour, in respect of atmospheric temperature, humidity and wind movement. In general, the lowest temperatures prevail at the early hours of the morning, and they almost invariably rise after 8 A. M.

The speaker presented a table (Table I), illustrating the extent of time during which a given temperature between 42° F. and zero prevailed in a single season.

The mean temperature, he said, varies but

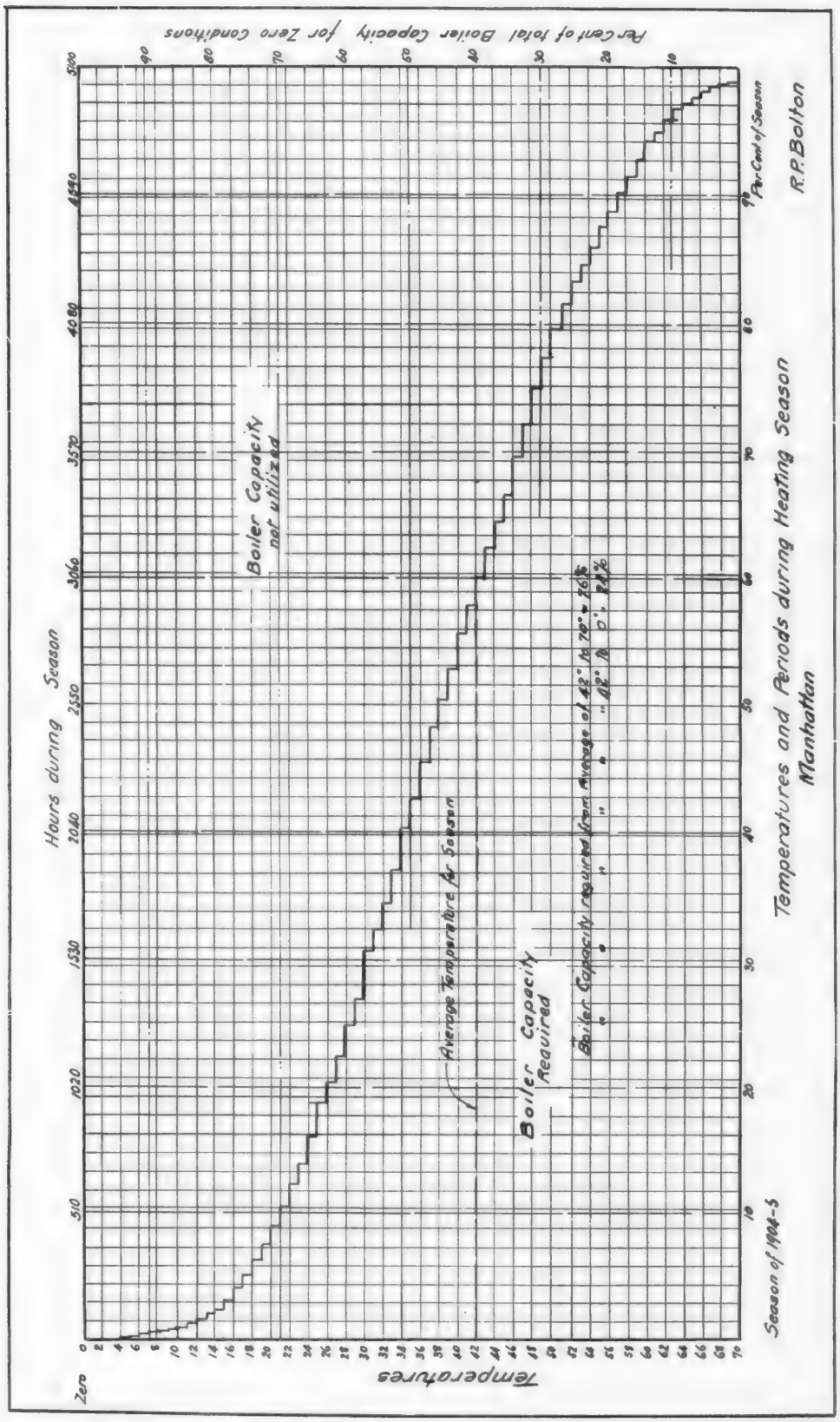

Temperatures and Periods during Heating Season
Manhattan
R.P. Bolton
Season of 1904-5
Hours during Season
Per Cent of Season
Per Cent of total Boiler Capacity for Zero Conditions
Temperatures
Zero
Boiler Capacity not utilized
Boiler Capacity Required
Average Temperature for Season
Boiler Capacity required from Average of 42° to 28° = 16%
" " " 42° to 0° = 22%

CHART ILLUSTRATING PERCENTAGE OF BOILER CAPACITY REQUIRED DURING HEATING SEASON IN NEW YORK CITY WHEN DESIGNED FOR ZERO CONDITIONS.

little over many years' records, from an average of 38° to 42° F., or about 60% of maximum difference, between zero and 70° F.

Table I—Heating Work in Per Cent. of Heating Season.

Temperatures, Deg. F.	Per Cent. of Time.
10 and below	61
15 " "	58
20 " "	43
25 " "	31
30 " "	19
35 " "	9
40 " "	3
42 " " average temperature	1

Table II—Use Made of Total Installed Radiation Capacity for Zero.

Capacity in Service, Per Cent.	Time in Service, Per Cent.
100	None
90	0.75
80	2.5
70	11.0
60	25.0
50	40.5
40	61.0
30	78.0
20	90.0
10	97.0

Table III—Monthly Percentage of Total Heating Work of the Season

(Average for 41 Years.)

Month.	Per Cent.
October	7.1
November	12.4
December	17.5
January	19.1
February	17.4
March	16.4
April	10.1

The speaker pointed out that the temperature of zero is rarely reached, and the time of its prevalence is very limited. Equivalent conditions to zero in still air seem to be reached by certain combinations of strong wind movement in moderately low temperature. The most severe demand, the effect of which he had observed, was that on January 13, of this year, when a wind movement of 17.9 miles per hour prevailed, in an average temperature of 1° F.

"Under these conditions," continued the speaker, "few of the heating installations in use fully sufficed to maintain a comfortable temperature in buildings exposed to the strong wind pressure, notwithstanding their proportion by theory to 'zero' conditions."

HEATING INSTALLATIONS DEFECTIVE IN FINANCIAL EFFICIENCY.

From the facts as presented Mr. Bolton drew the deduction that our methods of heating installation appear to be defective in financial efficiency. We provide installations capacitated for a maximum condition but utilizable to that extent only on rare occasions, normally utilized only to 60% of the full capacity, and in actual service to that extent only 57% of the year (Table II).

"The effective use of such an investment," he observed, "is therefore about 33% and careful consideration of this question leads to the inquiry whether some means should not be sought for decreasing the amount and cost of heating equipment and increasing its occasional capacity for temporary maximum demands by the use of higher pressure steam or by mechanical draft over the radiator, or by such auxiliary means as the use of gas."

Mr. Bolton stated the average investment in steam-heating apparatus is about $1.00 to $2.00 per square foot of installed direct radiation, an outlay which involves constant cost for interest, depreciation and taxation during periods of small utilization and of total disuse during nearly half the year.

The small use that is made of heating apparatus during mild weather makes its utilized product often excessively expensive, and recent observations made by the speaker on a low-pressure plant in New York City indicated that the cost of fuel and accompanying labor during as much as one-half of the heating season was in excess of that of gas, even at the cost of 80 cents a thousand cubic feet. Such observations as these, he stated, raise the presumption that for certain periods of a heating season it would be more economical either to employ gas radiators as a heating auxiliary, or to use gas as the fuel in a heating boiler.

LIMITATIONS TO VALUE OF EXHAUST STEAM.

"Such conditions," he added, "extend into the field of the relations of heating work to power plants and, when impartially considered, greatly limit the value commonly placed upon the utilization of exhausted steam for heating purposes from such power plants. A service having a time duration of 57% and a combined time and demand factor of only 33% is, in such combinations, sought to be served by and from a power operation having totally different characteristics, both of time and demand.

"Thus the generation of energy for industrial power purposes involves combination of a daily working period, of say 40%, of the daily heating demand, the demand for which exists during only 57% of the total plant operating season."

Mr. Bolton further showed that in the generation of electrical energy for lighting and power purposes the operations of the former in particular depend upon the fluctuations of light, which are unrelated to temperature con-

ditions. In heat demand the maximum is in the early hours of the day, and in light demand at the end of the working day.

A variety of observations of this character and a practice of cross-plotting the curves of usage of such services led him to the conclusion that, without regard to the economical use to which the heat or energy services are put, only about 30% of the total power steam in the combined plant of a city building can be utilized as exhaust steam in the work of heating such buildings, and the use of additional live steam must be depended upon to a greater or less extent, varying with the proportions which the size of the heating installation bears to the energy demand. He emphasized the fact that these results are without regard to economic usages, a point frequently overlooked in such comparisons, as are often instituted upon the operation of "isolated" plants with low-pressure heating or purchased steam for heating purposes.

"The prevailing habits of wastage in the use of heat, of light and of power," declared Mr. Bolton, "all tend in the direction of apparent economy in such combinations. The larger the waste in heating apparatus, the greater amount of exhausted steam can be utilized. The larger the waste in electrical energy, the greater becomes the possible source of such exhausted supply and the relatively cheaper appears the electrical product. But the net value of the work of heating is limited to its net necessity. It is clear from our most recent and determinate observations that necessary heating demands follow closely the variations of temperature. If such needs are closely followed, as may be in part effected by automatic control or by careful reductions of supply at the boiler, the cost of necessary heating becomes substantially reduced. Neglect or wasteful habits may increase this amount by leaving radiators on when not required, by opening windows and doors and by defective construction of window casings."

ANALYSIS OF VALUE OF STEAM AS A BY-PRODUCT.

Mr. Bolton then presented some interesting data and observations on the use of exhaust steam as a by product. A by-product, he pointed out, is only of financial value to the extent to which its utilization is actually economic and necessary.

"We are bound first to consider," he said, "whether the use to which such a by-product is put is wholly necessary and by what economic conditions it is limited. After reducing it to its net necessary extent, and then establishing its financial value by comparison of its cost with other available methods of effecting equally satisfactory results we must turn to an examination of the production of the by-product, which, to have that character, must be a justifiable wastage unaccompanied by other wastages. The necessary use of the source of the wastage thus becomes the next factor, and then its economic production.

"If, for instance, the operation of a power plant carries with it fixed additions of energy-expenditure, such as the operation of auxiliary appliances, feed pumps, drip pumps, return pumps, ventilating fans and lighting of engine rooms, we should regard these as burdens upon the so-called 'by-product,' which to that extent discount its economic appearance. The operation of a wasteful steam engine for twelve months, for the sake of a supply of exhaust steam for heating during seven months, is another instance in point.

"Back-pressure in engines and pumps due to steam heating may be, and often is, a cumulative burden, detracting from the value of the apparent by-product by necessitating the expense and operation of vacuum systems."

As an illustration the speaker said that if a building can be heated by low-pressure steam, by a smaller investment, by less and cheaper labor, with fewer incidentals, less upkeep and repair, the net value of any contribution of exhaust from a power plant is reduced to just the share of that expense which it contributes and no more. Any other part of the supply must be regarded as carrying its share of the common losses of a power plant, in condensation, leakages, auxiliaries and other costs of the annual season. The accompanying table (Table IV) was shown by Mr. Bolton to illustrate this process.

Table IV—An Analysis of a Heating By-Product.

	Pounds.
Steam raised	100
Moisture condensed in piping and leaks.	10
Used by auxiliary pumps, etc.	10
Engine receives	80
Exhaust condensation to waste.	16
Exhaust available for heating work, annual	64
Portion available in heating season, 57%	37
Utilizable heating period, 10 hours out of 24 = 40%	14.8
But of what engine received, if 15% was used in engine room, light and fans, then deduct from value of by-product	6.8
Net by-product	8.0

"Such considerations as these," concluded Mr. Bolton, "will be found to reduce the proportions of the value of exhausted steam heating, especially where the initial investment in power plant apparatus can be avoided by the use of simpler means or other sources of steam or power."

Table V—Observations on Cost of Heating Steam, March-May.

(Latter quarter of heating season of 1913-14. Seven-story office building, 42d St., Manhattan.)

Week of Season, No.	Coal, Lbs.	Water Evaporated per Pound, Lbs.	Efficiency of Boilers and Furnaces, Per Cent.	Cost of Coal and Labor.	Cost of Steam per 1,000 Lbs.
25th	5,177	6.54	50.8	$26.80	$0.82
26th	3,979	5.45	40.4	22.82	1.09
27th	4,271	5.68	44.0	23.90	1.02
28th	3,969	4.44	33.5	22.80	1.37
29th	3,048	1.38	10.8	19.90	4.86
30th	3,141	2.51	19.1	20.40	2.72
31st	2,454	2.39	18.3	17.96	3.17
32d	2,636	0.7	5.5	18.55	10.48

DISCUSSION.

Mr. Blackmore suggested that in estimating the cost of heating some means should be provided for ascertaining how much steam is used for heating the hot water supply so that the owner can tell how much he is paying for hot water.

Mr. Driscoll spoke of the means suggested for forcing air over radiators to increase their efficiency. Mr. Bolton said that one way in which this could be done would be by utilizing the office electric fans which are now in wide use in summer. Mr. Feldman told of how he had secured comfortable room conditions with a 60° room temperature on a particularly cold day by wetting the radiator surfaces.

Mr. Timmis, in discussing the arrangement of heating apparatus for efficient use in mild weather, told of the equipment he had designed for a loft building. The heating system was divided into a hot blast and direct heating system. For the greater part of the time, he said, it is only necessary to run the indirect system, the direct radiation being turned on only in extreme weather.

Mr. Addams spoke of the use of open coal grates for house heating in mild weather and said that the discussion had given him the explanation of why it was less expensive to operate such fireplaces in mild weather, with their wasteful features, than to run his boiler.

Mr. Blackmore suggested that a committee be appointed to get data on the exact heat losses through steam engines on account of the important bearing of this feature upon the cost of heating.

Mr. Perry West believed that the solution of the question can be gotten at closely enough from the theory involved and existing data, without going to the trouble and expense of conducting elaborate tests for this purpose. Profs. Barrus and Jacobus and others have conducted numerous tests for determining the missing feed or the proportion of the total feed to the engine cylinder which is not in the form of steam, both at the cut-off point and at the exhaust point. A record of these tests, he believed, could be found in the transactions of the Mechanical Engineers' Society. Numerous tests and estimates, he added, have also been made as to the amount of radiation from engine cylinders under various conditions. Henry G. Stott went into this subject quite extensively at the time the low pressure turbines were installed in the 59th Street subway station in New York and a report of his findings will be found in the proceedings of the American Institute of Electrical Engineers.

In summing up these data, Mr. West said that it will be found that the condensation due to cylinder radiation will be very closely approximated at 2 per cent. for large engines and 5 per cent. for small engines. Of course, we know that there is a large percentage of initial condensation which takes place when the steam first enters the engine cylinder, due to the transfer of the heat from the steam to the colder iron of the cylinder. During exhaust, however, most of this heat is transferred back again to the steam with a resulting re-evaporation about equal to the initial condensation.

There is considerable condensation, however, due to the work of expansion which the steam performs while in the engine cylinder, but this can be very closely estimated by determining the amount of work done per pound of steam and after reducing this to B.T.U. and dividing by the latent heat of steam at exhaust pressure, we will get about the right proportion of the steam condensed in this way. Adding the condensation due to radiation to that due to the work performed by the steam, we should arrive very closely at the total condensation in the exhaust steam, due to condensation in the engine cylinder.

Mr. Davis said that one would have to first assume a fixed engine room condition as to temperature.

The discussion then turned on the relative

value of live and exhaust steam for heating, Mr. Kimball citing a 1,000-h.p. plant where they had difficulty in heating the buildings. By starting up two of the engines and utilizing the exhaust steam there was no further difficulty.

Mr. Timmis gave it as his opinion that the solution of this problem lies in the kinetic energy of the steam. Exhaust steam, he said, enters the piping in puffs and achieves circulation through pulsations. He likened the action to that of a hammer driving a nail. Mr. Bolton thought it might also be a question of the saturation of the exhaust steam as against the slight superheat in the direct steam.

Mr. Kimball stated that as far as the pulsations of the engine are concerned he had noticed that at a point 2,200 ft. from the engines the pulsations were distinctly noticeable in the pipe line.

Referring more directly to the subject of the evening, Mr. Timmis spoke of the problem that often confronts the heating engineer when he is called upon to lay out a power and heating equipment for a building, which is, whether to install a central power plant and generate electricity for power or use steam for power.

Mr. Martin stated that in spite of the fact that 5,040 hours is generally considered to embrace the heating season in localities such as New York, as a matter of fact from 3,000 to 3,500 hours covered the time during which steam heat is used in a building. Mr. Martin gave some interesting figures on the cost of heating buildings per unit of space. He said that in a building containing 1,750,000 cu. ft. of space, in which No. 1 Buckwheat coal was used at $3.50 per ton, the cost of heating was found to be $1.75 per 1,000 cu. ft. In another building containing 6,500,000 cu. ft. of space, burning No. 3 Buckwheat coal, the cost of heating was $1.35 per 1,000 cu. ft. This cost, he added, includes labor, fuel, repairs and supplies.

Mr. Davis said that one of the most effective ways of reducing heating costs was by taking care of the peak loads and reducing same by cutting down the air leakage. He cited the case of the large group of buildings put up by the Girard Estate in Philadelphia and showed how the weatherstripping of the windows had changed an inadequate power plant to one of ample capacity.

Mr. Timmis gave an instance where a cold apartment house was effectively heated through the installation of a forced draft fan which gave immediate relief which was the essential element in that case.

In concluding the discussion Mr. Bolton stated that most boilers will run above their efficiency when operated under forced conditions. He also expressed his belief that the fireman of the future is to be a more highly paid and more highly trained man than at present, for it is here that the further economies in power and heat production are to be achieved.

Mr. Bolton was given a vote of thanks by the chapter for his address.

In reporting on the condition of the chapter Treasurer Arthur Ritter stated that there is at present $270 in the treasury. President Timmis announced the appointment of an entertainment committee composed of members of the chapter to arrange for the dinner and other entertainment features at the annual meeting of the American Society of Heating and Ventilating Engineers in January. This committee is composed of G. G. Schmidt, chairman; W. H. Driscoll, A. S. Armagnac, Conway Kiewitz, Homer Addams, C. E. Scott, C. A. Fuller, Frank G. McCann, Perry West and W. F. Goodnow. Secretary J. J. Blackmore of the Heating Engineers' Society, announced that President Lewis has appointed J. A. Donnelly and J. J. Blackmore to co-operate with the chapter's committee.

Nominations of Officers for 1915.

Following are the nominations made by the nominating committee of the American Society of Heating and Ventilating Engineers for 1915:

For president, Dwight D. Kimball, New York.

For first vice-president, Harry M. Hart, Chicago.

For second vice-president, Frank T. Chapman, New York.

For treasurer, Homer Addams, New York.

For managers: Frank Irving Cooper, Boston; Dr. E. Vernon Hill, Chicago; W. M. Kingsbury, Cleveland; Samuel C. Lewis, Chicago; Frank G. McCann, New York; J. T. J. Mellon, Philadelphia; Henry C. Meyer, Jr., New York, and Arthur K. Ohmes, New York.

In a circular sent out by the society announcing the nominations, it is stated that the annual meeting will be held in New York January 19-21, 1915. Two of the sessions will be symposiums on ventilation. Among the speakers who have already promised to take part are Prof. Frederic Bass, Minneapolis, Minn.; Prof. C.-E. A. Winslow, New York; Profs. G. C. and M. C. Whipple, Cambridge, Mass.; Prof J. W. Sheppard, Chicago; Dr. T. R. Crowder, Chicago; Dr. C. T. Graham-Rogers, New York; Dr. M. W. Franklin, Bloomfield, N. J.; D. D. Kimball, New York, and Reginald Pelham Bolton, New York.

A list of the recently elected members is given and the total membership of the society is shown to be 516, of which 131 are strictly consulting engineers, 168 are contracting and consulting engineers, 115 are manufacturing engineers and salesmen, largely graduate me-

chanical engineers, 31 are classed as miscellaneous, including members connected with trade papers, foreign members and those specializing in other lines, and 71 associate and junior members.

Brochure of the Heating Engineers' Society.

A well-compiled brochure of the American Society of Heating and Ventilating Engineers has been issued by the secretary, J. J. Blackmore. It is evidently the result of much painstaking care on the part of its compilers and reflects great credit upon them. In addition to presenting the advantages of membership in the society and how the society works, a section is devoted to the activities of the society, covering the work that has been completed and that which is now under way and proposed. These are detailed under the headings of heat transmission, fuel, chimneys, operating tests, ventilation, and tests of appliances, such as boilers, radiators, indirect radiators, and stoves and hot air furnaces.

The programme as outlined presents a vision of future achievements that is an inspiration, as well as a striking commentary on this ever-broadening field.

New Members.

Announcement is made of the election of the following to membership in the American Society of Heating and Ventilating Engineers:

KEACH EONE, Petersburg, Ill.
ALLEN A. BLOMFELDT, 108 N. Jefferson St., Chicago.
FRED S. BOLTZ, 129 Federal St., Boston, Mass.
EDGAR ALLEN CLINE, 3212 E. 9th St., Kansas City, Mo.
MICHAEL J. CALLAHAN, 343 W. 52d St., New York.
D. W. CHAPMAN, Canton, O.
HARRY WILMER CURRY, Edgewater, N. J.
BENJAMIN H. DAVIS, 603 Main St., Buffalo, N. Y.
CHARLES N. DUTTON, 561 Mission St., San Francisco, Cal.
REUBEN E. DOCKHAM, 204 North St., Salem, Mass.
WALTER LOUIS FLEISHER, 31 Madison Ave., New York.
MICHAEL J. GIBBONS, JR., 20 W. Third St., Dayton, O.
JOHN C. HORNUNG, 111 W. Monroe St., Chicago.
ROSS C. HOLLEY, North Tonawanda, N. Y.
OTTO J. KUENHOLD, Power Ave., Cleveland, O.
EDWIN A. McC. KINGSLEY, 354 W. 50th St., New York.
JOSEPH E. McCLURE, 8 Belmont Ave., Dubuque, Ia.
HERBERT B. McCLURE, 1101 Capitol St., Harrisburg, Pa.
JAMES CELESTINE MILES, 1924 Prospect Ave., Cleveland, O.
THOMAS GILBERT MOUAT, 162 E. 105th St., Cleveland, O.
BENJAMIN NELSON, 1510 Monadnock Bldg., Chicago.
H. M. NOBIS, 14 Howland Ave., Toronto, Ont.
LOUIS FERDINAND NORDINE, Moline, Ill.
JAMES S. OTIS, 2 East 23d St., New York.
WILLIAM HENRY SMEAD, 1028 Citizens Bldg., Cleveland, O.
ALFRED E. STACEY, JR., 1508 Fort Dearborn Bldg., Chicago.
HENRY A. VOLBRACHT, 4580 Park Ave., New York.
DEAN BAILEY WILHELM, 503 Bailey Farrell Bldg., Pittsburgh, Pa.
ARTHUR CUTTS WILLARD, University of Illinois, Urbana, Ill.

ASSOCIATE MEMBERS.

FRANK A. DOW, Hume Mansur Bldg., Indianapolis Ind.
WILLIAM M. FOSTER, Detroit, Mich.
HAROLD CARLTON HEWITT, 1217 Schofield Bldg., Cleveland, O.
JOHN HANSON MITCHELL, Richmond, Va.
JAMES FRANKLIN McINTIRE, Detroit, Mich.
CHARLES T. POTTINGER, 1027 Empire Bldg., Atlanta, Ga.
EDWARD ALFRED STARK, 1427 Schofield Bldg., Cleveland, O.

JUNIOR MEMBERS.

JOSEPH F. BRODERICK, 2076 La Fontaine Ave., Bronx, N. Y.
JAMES FRANK FIRESTONE, Dowagiac, Mich.
EDWIN ROBERT LITTLE, Winnipeg, Man.
VIRGIL A. ROOT, 7613 Wade Park Ave., Cleveland, O.

Illinois Chapter Elects New Officers.

The opening meeting of the Illinois Chapter for the fall season, October 12, was devoted to the election and installation of new officers. The following were elected: President, Charles F. Newport; vice-president, E. L. Hogan; secretary, W. L. Bronaugh; treasurer, August Kehm; board of governors, H. M. Hart, William Lee, Sr., and F. W. Powers. The meeting was held in the fraternity room of the Great Northern Hotel, Chicago, and was preceded by a chapter dinner.

Annual Meeting of Massachusetts Chapter.

At the annual meeting of the Massachusetts Chapter, held at the Revere House, Boston, October 13, the following officers were elected: President, Andrew G. Paul; vice-president, Eugene R. Stone; secretary, Charles Morrison; treasurer, William T. Smallman; board of governors, William G. Snow, Frank Irving Cooper and James W. H. Myrick. A satisfactory balance in the treasury was reported. Resolutions were engrossed on the death of Albert B. Franklin who, at the time of his death, was one of the governors of the chapter.

New York Chapter's Programme for the Winter.

The New York Chapter has prepared a programme for the monthly meetings throughout the winter and spring. The full list of topics, as revised, including that presented at the October meeting, are as follows:

October 19, 1914—The Relation of Heating Buildings to Power Plants. Introduced by Reginald Pelham Bolton.

November 16, 1914—Furnace Engineering—Tests—Adaptability. Introduced by Prof. E. H. Lockwood and Roy E. Lynd.

December 21, 1914—Heating the Skyscraper and Its Problems. Introduced by William H. Driscoll.

January—Annual meeting of the society.

February 15, 1915—Method of Air Measurement and Window Leakage. Speakers on each of these topics to be announced later.

March 15, 1915—To be announced.

April 19, 1915—Election of Officers. Reports of Committees. Topic, Coal Tests; speaker to be announced.

May 17, 1915—Annual dinner and installation of officers.

NATIONAL DISTRICT HEATING ASSOCIATION

Date Chosen for Next Annual Meeting.

At a meeting of the executive committee of the National District Heating Association, held in Chicago, October 29, it was decided to hold the seventh annual convention of the association at Chicago, June 1-3, 1915, with headquarters at the Sherman Hotel.

In a letter to the members, it is stated that the publication of the proceedings for 1914 has been completed and that it is the largest and best volume the association has ever issued, containing 388 pages.

As announced at the annual convention, the association has collected a great many forms of station records and blanks used by heating companies throughout the country. These have been mounted in book form and a case made to permit shipping safely by express. The book will be loaned by the association without cost to any member desiring to examine same, the member to pay transportation charges each way and to return promptly.

LEGAL DECISIONS

Assignment of Heating Contract—Termination by Destruction of Buildings or Plant.

A heating company agreed with a corporation which owned three buildings in San Francisco, the Monadnock, Rialto, and Crossley buildings, to supply all three buildings with steam. The company agreed to furnish steam for 24 hours a day at an approximate pressure of 100 lbs., and payment was to be made at the rate of one cent per cubic foot of distilled water returned through meters from the heating system. The life of the agreement was to be ten years. About nine months after it was entered into the corporation conveyed the Rialto and Crossley buildings to Mrs. Oelrichs. The heating company consented that the contract for the supply of steam might be assigned to her in so far as it related to these two buildings. Soon after, the buildings were practically destroyed in the great conflagration in San Francisco, as well as the heating station which had supplied them with steam. The Monadnock building having afterwards been rebuilt, the heating company refused to supply it with steam under the contract, claiming that the contract was rescinded by the destruction of two of the buildings and the heating station, and that the contract was entire and indivisible. In an action by the corporation for damages for the refusal, it was held that when the heating company consented to the assignment to Mrs. Oelrichs and agreed to supply her, there was a novation, under California Civ. Code, § 1531, declaring that a novation is made by the substitution of a new obligation between the same parties with intent to extinguish the old one. The heating company's agreement to supply the purchaser of the two buildings with steam in accordance with the contract with the corporation rendered the purchaser an independent customer. The contract was not, as claimed, an indivisible contract, and could be assigned to the purchaser of two of the buildings. The heating company's obligation to supply the corporation with steam for the building retained was not dependent upon the continued existence of all three buildings, there being no provision in the contract for its abrogation in such event. The assignment relieved the corporation from the obligation to pay for steam for all three buildings, the plaintiffs not occupying a position analogous to a lessee who has assigned his lease. Therefore the corporation might demand steam for the building retained, though the purchaser, after the destruction of the other buildings, did not rebuild and did not require steam. The contract for steam provided that the heating company should not be responsible for interruptions of service due to municipal interference, strikes, fires, actions of the elements, etc. It was held to be no defence to the action that, after the destruction of the heating company's plant it was not rebuilt. Interruption of the service by fire or other destructive agency was, by the terms of the contract, excused, but not made the basis for the termination of the status of the parties.—Law vs. San Francisco Gas & Electric Co., California Supreme Court, 142 Pac. 52.

Lien for Installing Furnace in Homestead.

Michigan Comp. Laws 1897, § 10,711, provide that a lien shall attach to a homestead for improvements made in pursuance of a contract signed by husband and wife. It

is held that under this statute a mechanic's lien for installing a furnace in a dwelling occupied as a homestead by husband and wife will not be enforced where the contract therefor was signed by the wife alone, without authority to act as agent for the husband, who did not recognize the contract nor his liability thereunder, but knew that the furnace was installed, and admitted that he made no arrangements for the installation of the furnace, but left it to his wife.—Holland Furnace Co. vs. Hartig, Michigan Supreme Court, 148 N. W. 169.

Improper Placing of Piping.

In an action for the contract price for the installation of a hot-water heating plant there was a verdict and judgment for the plaintiffs. On appeal the judgment was affirmed on condition. The plaintiffs agreed that the heating plant should have a stated heating capacity. The court found that this agreement had been complied with. In the installation of the plant the plaintiffs extended the risers from the floor to the ceiling, where the pipes were angled off horizontally at convenient distances, and without uniformity, beneath the ceiling, and then extended through the ceiling to the floor above and connected with the radiators. There was evidence that this was not a workmanlike way of placing the pipes and that the rooms were made unsightly. The trial court charged the jury, in effect, that the placing of the pipes in this manner, instead of between the ceiling and the floor above, was of no particular consequence, and nothing more than nominal damages could be allowed for it. There was evidence to the effect that it would cost $200 to put the pipes in the condition required by good workmanship. In its answer the defendant claimed damages of $100. The Supreme Court held that the claim of the defendant was not one to be disregarded. It was at least for the jury, and the charge was erroneous. It was therefore held that a new trial must be had unless the plaintiffs consented that their verdict be reduced by the sum of $100.—Johnson vs. Church of St. Charles, Minnesota Supreme Court, 148 N. W. 281.

Progress in Drafting Standard Boiler Specifications.

Further progress in the drafting of standard boiler specifications is reported by the Boiler Specifications Committee of the American Society of Mechanical Engineers as the result of its public hearings, held September 15 and 16, in the rooms of the society and its subsequent conferences. In the public hearing on September 15, the speakers included Edward H. Wells, president of the Babcock & Wilcox Company, who endorsed the movement for standard specifications for steam boilers, and Thomas E. Durban, who expressed his hearty approval of the committee's action in formulating the Code of Boiler Rules. Earnest T. Child, representing the National Association of Master Steam and Hot Water Fitters, expressed the satisfaction of that body with the proposed code and urged its adoption.

After the method of procedure had been taken up and decided upon, the hearing was devoted first to the consideration of written discussions of the committee's recommendations. One of the most interesting discussions of the day was on the subject of safety valves. A committee of the American Society of Heating and Ventilating Engineers was also heard on the subject of boiler specifications.

In order to enable the various interests to be heard, the committee in addition to the meeting held September 16, arranged for additional conferences. On September 26, the committee representing the boiler tube interests met with the boiler specifications committee and presented a complete specification that is proposed for boiler tubes, both lap-welded and seamless. Also a representative of the National Association of Master Steam and Hot Water Fitters appeared before the committee and expressed the approval of that association to the committee's work and particularly the changes recommended by the National Boiler and Radiator Manufacturers' Association and the American Society of Heating and Ventilating Engineers.

Explanation of Coefficient Table for Estimating Radiation.

In connection with an article on "Steam Meter Rates in Seven States," which appeared in THE HEATING AND VENTILATING MAGAZINE for September, the author contributed a table which has attracted much attention, giving the coefficients for estimating radiation for use with various types of building materials and based on an outside temperature of 10° F. below zero and an inside temperature of 70° F.

Four columns of figures were given in the table, and it should be stated that the first column is the B.T.U. loss per square foot per degree difference of temperature between the inside and outside. The second column gives the square feet of radiation required per square foot of exposed area for a temperature difference of 80°; that is, an outside temperature of 10° below zero and an inside temperature of 70°, when a vapor system of heating is in use. A heat transmission of 240 B.T.U. per square foot of radiating surface is assumed for the vapor system.

The third column gives the radiation required under similar conditions, excepting that a low-pressure steam-heating system is assumed, with a heat transmission of 280 B.T.U. per square foot of radiation.

The fourth column gives the demand in pounds of steam per hour per square foot of exposure, based upon the assumption that each pound of steam will deliver 960 B.T.U.

It is stated that the table has been in use for a number of years and has been found to be thoroughly reliable.

COEFFICIENTS FOR ESTIMATING RADIATION.

BASED ON OUTSIDE TEMPERATURE OF 10° F. BELOW ZERO AND INSIDE TEMPERATURE OF 70° F.

Single glass, loose	1.50	0.500	0.430	0.125
Single glass, medium	1.35	0.450	0.390	0.113
Single glass, tight	1.20	0.400	0.340	0.100
Double window (storm)	0.60	0.200	0.170	0.050
Vault glass (sidewalk)	1.50	0.500	0.430	0.125
Single skylight glass	1.08	0.360	0.310	0.090
Double skylight glass	0.60	0.200	0.170	0.050
Good door, half glass	0.69	0.230	0.200	0.058
Good door, solid	0.48	0.160	0.140	0.040
Poor frame wall, N. & W.	0.45	0.150	0.130	0.038
Poor frame wall, S. & E.	0.42	0.140	0.120	0.035
Average frame wall, N. & W.	0.42	0.140	0.120	0.035
Average frame wall, S. & E.	0.38	0.130	0.110	0.032
Frame, back plastered, N. & W.	0.33	0.110	0.094	0.048
Frame, back plastered, S. & E.	0.30	0.100	0.085	0.025
8-in. brick wall, N. & W.	0.39	0.130	0.110	0.033
8-in. brick wall, S. & E.	0.35	0.120	0.100	0.029
12-in. brick wall, N & W.	0.30	0.100	0.085	0.025
12-in. brick wall, S. & E.	0.27	0.090	0.077	0.023
17-in. brick wall, N. & W.	0.24	0.080	0.069	0.020
17-in. brick wall, S. & E.	0.22	0.070	0.060	0.018
Ceiling—floor above	0.15	0.025	0.022	0.006
Floor—not plastered beneath	0.30	0.050	0.043	0.013
Partition—plastered both sides	0.20	0.030	0.026	0.008
Cubic contents:				
Half change per hour	0.009	0.003	0.003	0.0003
One change per hour	0.018	0.006	0.005	0.0015
Two changes per hour	0.036	0.012	0.010	0.0030

New Chicago Ordinance Requires Smokeless Down-Draft Boilers.

According to a notice to architects, heating and ventilating contractors and boiler manufacturers, sent out by the Department of Smoke Inspection, this department has recently concluded an investigation of the operation of heating boilers equipped with smokeless furnaces and states that the results of this investigation prove conclusively that this type of apparatus can be operated without violating the smoke ordinance.

"The Smoke Abatement Commission," continues the notice, "has therefore directed this department to put into effect beginning October 1, 1914, a rule prohibiting the use of heating boilers above certain sizes not equipped with smokeless furnaces. This ruling prohibits the use of internally fired boilers above certain sizes, which are equipped with the ordinary up-draft grates, in which the fresh fuel is thrown directly on the hot fuel bed, and which are not equipped with some type of smokeless furnace.

"After October 1, 1914, the Department of Smoke Inspection will not permit the use of heating boilers which are not equipped with some type of smokeless furnace in buildings containing six apartments and over, and in all factories or mercantile buildings, and buildings of other types containing more than 1,200 sq. ft. of radiation.

"It will be necessary before securing a building permit for the erection of a new building of the above-mentioned class, to present the building plans at this office and have same approved by this department.

"In addition it will be necessary to have the number, size and type of boiler to be used, together with the amount of radiation, and also the size and height of stack, marked on the boiler room plan.

"O. MONNETT, Smoke Inspector."

Commenting on the order, the *Ideal Heating Journal,* published by the American Radiator Company, says:

"Heretofore, if the owner of a building would agree in writing to use anthracite or semi-bituminous fuel (such as Pocahontas smokeless), then boilers of the direct-draft type could be installed in buildings of the

classes named in the notice. This new notice cancels that privilege.

"It is understood that this ruling does not affect residences, inasmuch as the Department of Smoke Inspection has not been given jurisdiction over heating boilers in residences, and which as a general rule use hard coal."

Current Heating and Ventilating Literature.

Under this heading is published each month an index of the important articles on the subject of heating and ventilation that have appeared in the columns of our contemporaries. Copies of any of the journals containing the article mentioned may be obtained from THE HEATING AND VENTILATING MAGAZINE *on receipt of the stated price.*

CENTRAL STATIONS—

Central Station in Office Building Basement. Auxiliary generating and steam heating plant of the N.-W. Electric Co., Portland. Ills. 900 w. Elec Wld—Sept. 26, 1914. 20c.

REFRIGERATION—

Heat Insulation for Refrigerating Rooms. W. M. Thornton. Read before the British Assn. in Australia. Calls attention to the practical importance of the variation of thermal conductivity of bad conductors in the choice of insulating materials. 2500 w. Engng—Sept. 18, 1914. 40c.

TRAIN HEATING—

Train Heating. Ray Stearns. Discusses methods of heating with regard to the suitability of each for particular traffic requirements. Detailed description of the two most common types of heating devices. Ills. 4000 w. Gen Elec Rev—Sept., 1914. 40c.

Connecting Returns to Traps.

The method of connecting returns to a trap may often be the cause of considerable difficulty, particularly where the return branches are connected near one another to a return header. For example, an installation with which the writer is familiar was connected as shown in Fig. 1. The pressure varied at times

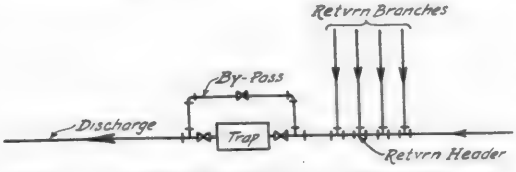


FIG. 1—CONNECTIONS OF RETURNS TO TRAP WHICH CAUSED TROUBLE.

to a slight extent in the several returns connecting to the return header. The returns from the nearest radiator having the higher pressure would discharge freely and back up into those which collected the condensation from the radiation at a more distant point and, therefore, at a lower pressure.

The difficulty was overcome by making the connections as shown in Fig. 2. Each connection was made by a Y fitting and 45° elbow. The higher pressure then had a tendency to relieve itself by forcing directly ahead past each branch and also produced an effect somewhat similar to that of an ejector. The condensation from the branch at higher pressure entering the return header through

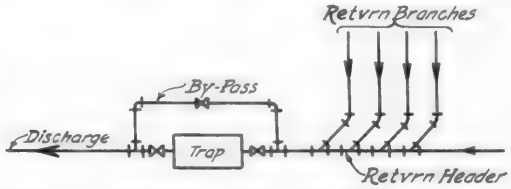


FIG. 2—REMEDY FOR TROUBLE AT CONNECTION OF RETURNS TO TRAP.

the Y fitting increased the circulation in the other returns by suction. A further advantage was secured by making the return header as large as practicable, the large header having the effect of equalizing the pressure to a certain degree and produced better results.

NEW DEVICES

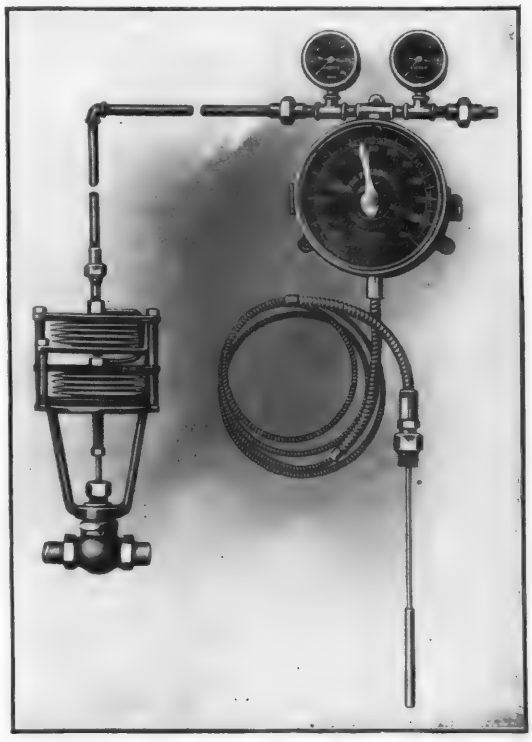
A New Temperature Controller.

A temperature controller of simple design, and said to have extreme accuracy and reliability, has been placed on the market by the Industrial Instrument Co., Foxboro, Mass. The Foxboro controller is referred to as a credit to the already very complete line of Foxboro instruments. The illustration shows the controller with bulb and diaphragm valve.

The diaphragm valve is made entirely of metal having no rubber parts and is actuated either by pressure or vacuum. The vacuum system of control is considered better than pressure as no moisture will accumulate in the piping. Operating by either system the Foxboro controller is designed to automatically close the diaphragm valve, thereby preventing overheating, if by accident the pressure or vacuum system is out of commission.

The small gauge on the right of the controller indicates the amount of pressure or vacuum maintained by the supply system. The gauge on the left indicates when and how much pressure or vacuum is used to operate the diaphragm valve.

The small valve inside the controller case which allows pressure or vacuum to operate the diaphragm valve is itself controlled by the same type of helical spring as used in Foxboro recording thermometers. This means that the most important feature of the regulator has already been tried out by the experience which the engineers of the Industrial



FOXBORO TEMPERATURE CONTROLLER WITH BULB AND DIAPHRAGM VALVE.

Instrument Co. have had in recording thermometers. The working parts inside the controller case are few and simple.

Additional information as to the application and detailed construction of the Foxboro controller may be had from the manufacturers.

A New Method for Tin Lining or Coating.

Epicassit is a German material which serves to protect metal against corrosion. It consists of pure tin powder reduced to dust and a liquid deoxidizer. These are mixed to the consistency of a thick paint. The metal surfaces to be coated should be carefully cleaned, painted with Epicassit and then heated by any suitable means, as over a charcoal fire, a powerful blow torch, etc., to the melting point of the coating metal. The coating made with Epicassit, it is stated, will run no more than does paint, thus making possible the tinning of vertical or even of inverted surfaces.

Epicassit does not compete with dip coating methods where those are available but is intended for use in a field of its own. Articles of any size, weight or wall thickness whether steel, wrought iron, cast iron, copper or brass, etc., may be tinned without dismantling or moving. The usual loss of material attending the ordinary methods of applying metal coating is avoided by Epicassit, as there is no oxidation or drip waste. Epicassit, it is stated, is quickly applied at a greatly reduced labor cost.

One of the points emphasized in the use of this method is that an Epicassit metal coat may be applied to one side of an article only, at a saving of one-half the metal in dip coating and, in addition, coatings which have been locally damaged can be promptly and easily repaired with Epicassit. The saving of dismounting, remounting, shipping to and from dipping plant is many times the value of Epicassit material and labor of applying, to say nothing of taking the job out of commission only a few hours instead of days or weeks.

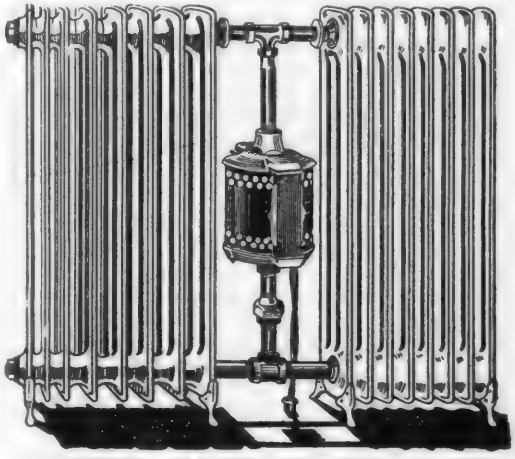
Epicassit is not a new material, though new to this country. As stated above it was compounded in Germany and has been employed for many years by makers of machines, etc.

This material is now made available here in five brands to suit various uses by Hess & Son, Philadelphia, Pa.

A Novel Electric Water Heater.

A new electric water heater, based on the inductive theory, has been invented by W. D. Ludwick, of Tacoma, Wash., and has recently been placed on the market. The apparatus is described as an excellent means of heating stores and halls. One of the accompanying illustrations shows the heater connected to an individual radiator. A 2½ K. W. heater installed in the manner shown has been found of sufficient capacity to heat two ordinary rooms at a cost of 1¼ cents per hour in Tacoma, where the heating rate is ½ cent per K. W.

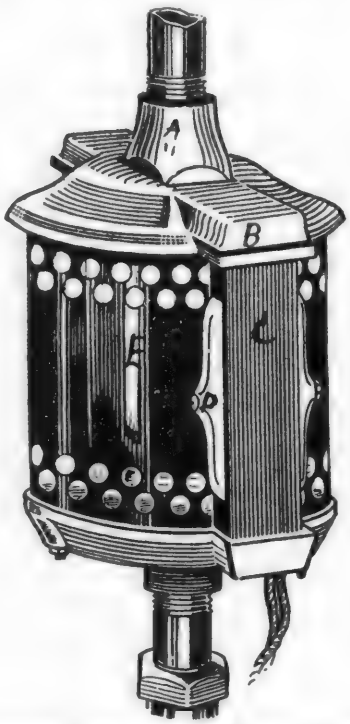
The working principle of the heater is as follows: The primary winding is connected directly on the line of 220 volts, alternating current. The cast-iron core in the center of the coil acts as the secondary winding, similar to the ordinary transformer. The primary side pulls 25 amperes at 220 volts. This volt-



ELECTRIC WATER HEATER AS CONNECTED TO RADIATOR.

age is reduced on the secondary side to a fraction of a volt while the amperage rises in direct proportion to the drop in voltage. The cast-iron core is shorted within itself so that all the current that flows into it goes directly into heat.

By referring to Fig. 1 it will be noted that A is the cast-iron core with water passages through it. B B are the top and bottom plates



INDUCTION ELECTRIC WATER HEATER.

built of cast-iron and so beveled that when tightened up by two machine bolts they clamp the laminations C tight against the cast-iron core A, thereby completing the magnetic circuit.

The laminations C are built in the form of a square arch. In the square of the arch is placed the primary coil (magnetic coil). This magnetic coil is built up with No. 6 bare copper wire laid in a composition of silica soda valspar and asbestos and then baked, making the coil free from possible short circuits, besides being waterproof and indestructible by heat.

The inventor states that in a test for endurance, one of these heaters was connected up to the line without any water connections and the current turned on. It was allowed to run for 1½ hours. In 30 minutes the cast-iron core became red hot, then turned white. At the time the current was turned off, the cast-iron was just below the melting point. The heater, however, was not damaged in any way and is at the present time in successful operation.

The induction electric water may also be applied to the heating of water in hot water tanks for domestic purposes for which use it is stated that it will heat 30 gals. of water wtih 2½ K. W.

The device has recently been placed on the market by the Electric Heating Co., 759 South D street, Tacoma, Wash.

Trade Literature.

RICHMOND REPORTER for October 1914, is the title of a new house organ devoted to the products of the Richmond Radiator Company, 1480 Broadway, New York. As shown by a map illustrating the location of the company's five plants, these products include Richmond boilers, Richmond radiators, Richmond vacuum cleaners and Richmond enameled ware. A feature of the initial number of the Richmond Reporter is a sketch of the business now known under the name of the Richmond Radiator Company, with a half-tone reproduction of Apollos Richmond, who founded the original Richmond Stove Company in 1867. In the editorial announcement, it is stated that the Richmond Radiator Company is in no sense a continuation of the business of the McCrum-Howell Company, but is composed of men who had no connection with the old concern. "The new company," it adds, "with ample financial backing, purchased at receiver's sale, all of the assets of the bankrupt concern, assuming, of course, none of the liabilities; taking over only plants, machinery, goodwill and trade marks." Regarding the policy of the publication, the publishers state that they intend making the journal of actual help to the heating and plumbing trade. The number contains detailed descriptions, with illustrations, of the company's various plants, including a history of the development of each plant. Size 7x10 in. Pp. 12.

SPRAGUE ELECTRIC DYNAMOMETERS, a machine for measuring horsepower generated or absorbed, is the title of a new catalogue (Bulletin No. 48701) published by the Sprague Electric Works, New York. By the use of this device it is stated that actual values of torque and speed can be measured at any and all loads and speeds within the range of the machine under test. It is considered especially useful for testing gasoline engines and other prime movers; for testing the power required to drive centrifugal pumps; and for testing belts, tires and transmissions. The Sprague electric dynamometer is built in all sizes from 1 H. P. to 200 H. P. and for speeds up to 3,500 R. P. M. Detailed instructions, together with illustrated diagrams, are given in the bulletin, showing how to make the different tests. Size 8 x 10½ in. (standard). Pp. 24, punched for binding.

WESTINGHOUSE VENTILATING OUTFITS, made up of motor-driven ventilating fans and blowers, are the subject of a new publication describing these outfits which are made by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. They are for use especially in such quarters as stores, workrooms, kitchens, lavatories, and engine rooms, while they may

WESTINGHOUSE MOTOR-DRIVEN BLOWER CONNECTED TO RADIATOR.
Air is brought in from the outside and discharged through the radiator.

also be utilized with success, in the ventilation of small and medium-sized quarters, for the supply of fresh air and the removal of foul air, smoke, steam, odors, etc. The outfits consist of a small electrict motor and a fan or blower, and are furnished in a variety of sizes. The illustrations in the circular show a Westinghouse-Ventura disc fan and a Westinghouse-Sirocco blower. Typical installations are included, showing the use of each type. A folder accompanying the circular contains full sizes and price lists.

CONNERSVILLE BLOWERS, EXHAUSTERS, PUMPS AND JET CONDENSERS, made by the Connersville Blower Co., Connersville, Ind., are summarized for quick reference purposes in a data sheet covering these products. The company's line of blowers, it is stated, run up to 400 cu. ft. per revolution, with from ½ to 10 lbs. pressure. The Connersville gas pumps are built for the same limits, while the rotary water pumps can be furnished up to 1,900 gals. per revolution. The company also manufactures oil pumps, flexible couplings, non-vibrating relief valves, and blast valves. The company enjoys the reputation of being the world's largest builders of rotary positive blowers and pumps, and emphasizes the fact that all of its machines contain two moving parts only, while the impellers do not touch each other or the cylinder, so that no internal oiling is necessary. This, it is stated, results in a clean discharge, with no loss in efficiency.

IDEAL HEATING JOURNAL for October, 1914, published by the American Radiator Company, Chicago, continues its interesting discussion of chimney draft formulas, which are accompanied by charts and tables for the solution of problems of correct chimney draft. This number also contains numerous items of general interest, such as "Government Searches for New Fuels," "Center Air Relief for Vento Stacks" and the new Chicago ordinance requiring the use of smokeless downdraft boilers after October 1, 1914, in buildings, except residences, containing six apartments or more, and in other buildings containing more than 1,200 sq. ft. of radiation.

POWELL STEAM WHISTLES AND WHISTLE VALVES, made by the Wm. Powell Co., Cincinnati, O., are featured in a new catalogue, in which is illustrated a complete line of these whistles, which have been designed to meet the exacting requirements in volume of tone and intensity of harmonious sound. The company states that its whistles are now in use on locomotives, steamboats, etc., and in most industrial plants all over the world. The company also manufactures and carries in stock a complete line of valves, lubricators, cocks-unions, oilers and grease cups. Size of whistle catalogue, 3½ x 6½ in. Pp. 16.

WOOD WATER PIPE, a machine-made wood stave pipe, for water works systems, power plants, mill and manufacturing plants, for conveying heavy fluids, acids, pulp and brine and for use as a wood covering for steam pipes, is treated in a carefully-compiled catalogue, published by the Standard Wood Pipe Co., Williamsport, Pa. The catalogue starts out by giving twenty reasons for using wood pipe, such as that it is preserved by water and not rusted or corroded by it, that it is as durable as cast-iron and more durable than wrought iron and steel, while its carrying capacity is 20 per cent. greater and at the same time, it is cheaper. A history is given of the use of wood pipe and facts presented to demonstrate its durability. Tables are also added giving the approximate weight per foot, and other data; the comparative cost of laying wood pipe, cast iron and steel riveted; the comparative carrying capacities; and the ability of the wood stave pipe to withstand pressure. The catalogue then takes up the construction of the Standard wooden stave pipe, showing how it is installed, illustrated with numerous detail views. The catalogue concludes with useful information on the subject of water, including pressure of water at different elevations, table of areas of wood pipe, friction of water in pipes, etc. Size 5¼ x 9 in. Pp. 32.

How? is the title of an illustrated circular published by Walter B. Snow, publicity engineer, Boston, Mass., which is described as "a

brief visualized answer" to the question so often asked as to how he takes care of a client's publicity. The circular shows typical advertisements and catalogues gotten up by this company as well as the titles of a few of the articles furnished to the technical press.

M.-H. BRASS VALVES are the subject of the latest Monthly Bulletin of Product, published by McNab & Harlin Mfg. Co., Paterson, N. J. These include a full line of standard valves for 125 lbs. pressure; medium valves for 200 lbs. and extra heavy valves for 250 lbs. pressure, covering globe, angle, cross, check, etc., screwed or flanged, with either screwed in or bolted-on bonnet. The bulletin describes in detail the material used and the construction of the different parts of the valves, some of which are also illustrated. Size 5 x 7 in. Pp. 10.

OWNERSHIP NOTICE.

Statement of the ownership, management, etc., of THE HEATING AND VENTILATING MAGAZINE, published monthly at New York, N. Y., required by the Act of Aug. 24, 1912.

Name of— *Post-Office Address.*

Editor, A. S. Armagnac, 1123 Broadway, New York.

Business Manager, Gustave Petersen, 1123 Broadway, New York.

Publisher, Heating and Ventilating Magazine Co., 1123 Broadway, New York.

Owners (if a corporation, give names and addresses of stockholders holding 1% or more of total amount of stock):

Heating and Ventilating Magazine Co., 1123 Broadway, New York.

A. S. Armagnac, 1123 Broadway, New York.

Gustave Petersen, 1123 Broadway, New York.

Known bondholders, mortgagees and other security holders holding 1% or more of total amount of bonds, mortgages, or other securities:

None.

(Signed) A. S. ARMAGNAC, Editor.

Sworn to and subscribed before me this 30th day of September, 1914.

(Seal) (Signed) A. L. SCANTLEBURY, No. 64. Notary Public, Kings County, Certificate filed in New York County.

(*My commission expires March* 31, 1915.)

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* Every other month.

TRADE AND MISCELLANEOUS NOTES

Coming Events.

Third Monday in Each Month—Meeting of the New York Chapter, American Society of Heating and Ventilating Engineers, Engineering Societies' Building, 29 West 39th St., New York (evening). Subject for November meeting (Nov. 16): "Furnace Engineering—Tests—Adaptability."

Second Monday in Each Month—Meeting of the Illinois Chapter, American Society of Heating and Ventilating Engineers, in Chicago (evening).

Second Tuesday in Each Month—Meeting of the Massachusetts Chapter, American Society of Heating and Ventilating Engineers, in Boston (evening).

Nov. 27-Dec. 6, 1914—Annual meeting of the American Public Health Association, Jacksonville, Fla.

Deaths.

J. J. Houlihan, chief boiler inspector of Chicago and secretary of the board of examining engineers under Mayor Busse, died September 27 from pneumonia at the Garfield Park Hospital. He was 54 years old. Mr. Houlihan was formerly connected with the L. H. Prentice Co., Chicago, heating engineers and contractors and was a member of the Chicago Master Steam Fitters' Association.

Miscellaneous Notes.

Indianapolis, Ind.—The matter of rates for central station heating and electric current service in Indianapolis is still the subject of hearings conducted by the Public Service Commission of that State. Under the new law creating the commission the companies are forbidden to discriminate in their heating rates, which, in the past, has been the occasional practice. The hearings cover the methods of the Merchants' Heat and Light Company and of the Indianapolis Light & Heat Company. In the case of the Merchants' company, the commission found some 300 contracts which, it was alleged, were discriminatory. These consisted, in some cases, of "blanket" contracts with the owners of buildings or flats, providing that the company was to get the exclusive business of all the tenants. The contracts provided lower rates than those filed by the company and were executed before the utility law became effective. The company contends that they are, therefore, not affected by the law. The Indiana statute governing utilities makes no mention of contracts existing at the time the law took effect, as does the Wisconsin law, and this leaves it to the commission to decide whether the agreements shall stand. One of the results of the hearings is that the Public Service Commission will not confine itself to fixing a rate to be charged by the light and heat companies for users of hot water heat, but will also fix the standard for service and the method of measuring the radiation. Previous to turning on the heat for this year, the Merchants' company informed its patrons that the rates would be based on the amount of radiation required instead of the radiation installed. This has brought forth protests from more than 100 users of hot water heat. The Indianapolis Light & Heat Company was called into the hearings following the Merchants' company,

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so that no decision will be reached until the Indianapolis company is heard. One of the principal witnesses so far heard is Byron T. Gifford, chief enginer of the American Public Utilities Company, which controls the Merchants' company. Mr. Gifford advocated the adoption of the "radiation required" method of charging, and showed how its operation would result in fairer charges, both from the companies' and the consumers' standpoint.

Indianapolis, Ind.—The city of Indianapolis recently awarded to the Merchants' Heat & Light Company, of that city, a ten-year contract, effective next April, for lighting the city streets, which, it is represented, will result in a yearly saving of $70,000. The Indianapolis Light & Heat Company, which holds the present contract, protested against the granting of the contract to its competitor and appealed to the Public Service Commission to set aside the contract on the ground that the Merchants' company is not equipped to carry it into effect and that the extension of its lines would represent duplication of property. In the brief filed by the Merchants' company it is claimed that the city, like any other consumer, has the right to determine with what utility it shall contract for service. It is also claimed that the powers of the commission are limited to requiring the utility to perform the service which the city officials have determined upon for a compensation which shall not be unreasonable nor unjustly discriminatory. The decision of the commission is awaited with keen interest by the various parties interested.

Walter B. Snow, publicity engineer, Boston, Mass., announces the removal of his offices to Rooms 511-516 in the new Federal Street Building, 136 Federal street.

National Founders' Association will hold its eighteenth annual meeting at the Hotel Astor, New York, November 18-19, 1914.

Billings, Mont.—In spite of the protest of the chief creditor and the recommendation of the receiver, an order was issued by Judge Pierson of the district court for the sale of the Billings mutual heating plant to P. B. Moss for $35,000. The heating plant was an asset of the First Trust and Savings Bank, of which Moss was president and which was closed at the time the First National Bank was suspended. The receiver contended in his report that the plant was worth $50,000. Mr. Moss stated that he would sell the plant to the users. As a result Joseph Zimmerman called upon some thirty of the patrons and found them to be in favor of a proposition to buy the plant and operate it. The gross income last year

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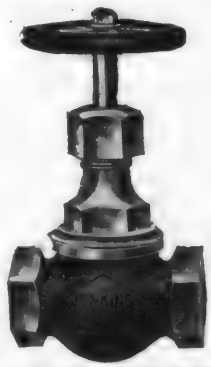
from the plant was $32,807 and the cost of operating it was $25,639. It embraces 109,000 sq. ft. of radiation. The rates for heating last year were 30 cents per sq. ft. of radiation. This year 40,000 sq. ft. of radiation have been added and it is figured that with each patron investing 50 cents for every square foot of radiation used, the sum of $75,000 would be raised. If this is done, a number of improvements will be added.

Seattle, Wash.—With Cedar Lake at its lowest level in years because of the dry summer, Seattle was saved from being thrown into partial darkness only through the operation of the new auxiliary steam generating station on Lake Union, which was recently completed.

Bangor, Pa.—An interesting situation has arisen in Bangor through the action of the local power plant, which has a central heating service, in shutting off its supply of steam heat. As a result 90 residents of the town have complained to the Public Service Commission claiming that the shutdown was due to spite. The plant, which was built by the Bangor Electric Light, Heat & Power Company, has been supplying steam for heating purposes for the past ten years. Many of the more recently-built houses are constructed without chimneys as a result of this service. The Bangor company was absorbed some time ago by the Pennsylvania Utilities Company and, later, the Utilities company was merged into the Eastern Pennsylvania Power Company. That company, in turn, became the possession of the Atlantic Gas & Electric Company, which embraced 27 local companies. Recently the Atlantic company went into bankruptcy and since then the Eastern Pennsylvania defaulted on the interest of its several issues of bonds. The immediate cause of the shutdown was the refusal of the Bangor borough council to allow the Eastern Pennsylvania to set up poles for the purpose of supplying Bangor with light and power from one of its large central power stations. This would have put the Bangor plant out of business, including the steam heat supply.

Elkhart, Ind.—The proposed franchise for a central heating plant in Elkhart is still under consideration by the city council. The council, through its ordinance committee, is holding conferences with F. R. Flynn and others who are seeking the franchise. The idea is to build a central heating and refrigerating plant costing about $100,000 to supply the district bounded by the Big Four right-of-way and Sixth street and the Lake Shore right-of-way to Crawford street. The life of the proposed grant it 25 years, but the city, it is expected, will reserve the right to purchase the plant at the end of each five-year period. The draft now provides for the payment of 5 per cent. of the gross receipts to the city and a graduated tax thereafter. While the rates for service will be given in the franchise, under the new public utility law, the State commission has the power to fix them. However, the franchise will contain the figures so as to prevent confusion in the event the utility law is ever repealed. The proposed plant will have a main station



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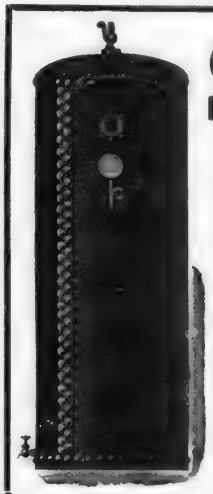
Olympia, Wash.—After many months' delay, with hopes of financing the completion of the steam heating plant in Olympia, a franchise for which was granted to W. B. Foshay and Millard Lemon originally, work of replacing the pavement over the pipe trenches has been commenced by the American District Steam Company, the contractor for the installation. There is about 2,210 ft. of piping which is encased in cedar conduits which will be left under the payment. It is stated that this action does not mean the abandonment of the project. Although the time limit mentioned in the franchise has expired, it is thought probable that the city will re-grant the right to build when conditions become more favorable. The material under the ground and the partially completed boiler plant, are valued at $25,000.

Evansville, Ind.—Building Inspector Kerth has announced that hereafter he will enforce the provision of the building code which requires firms installing heating apparatus to take out building permits. It was stated that inasmuch as hot air, hot water and steam heating plants must be inspected, the city should have the building permit fee to cover the expense of inspection.

St. Louis, Mo.—Daniel Hogan, president of the Hogan-Sunkel Heating Co., St. Louis, was painfully injured October 13, when he was pinioned under his automobile at it plunged over an 8-ft. embankment.

Eastern Supply Association, at its annual meeting in New York, October 14, elected the following officers: President, L. O. Koven, L. O. Koven & Bro., New York, (re-elected); first vice-president, G. R. Adams, Samuel Sloan Co., Rochester, N. Y.; second vice-president, Jos. F. Evans, Wyoming Valley Supply & Mfg. Co., Wilkes-Barre, Pa.; treasurer, Martin Behrer, Behrer & Co., New York; secretary, Frank S. Hanley, New York. Board of directors: L. O. Koven, G. R. Adams, Joseph F. Evans, Martin Behrer, W. L. Blake, James F. Conran, James P. McPhail nad A. A. Tomlinson; advisory, P. M. Beecher, Syracuse, N. Y. One hundred and fifty members were registered at the meeting. The principal speakers were John C. Reed, consulting engineer for the Standard Sanitary Mfg. Co., who spoke on "The Manufacture of Enameled Ware," and G. R. Adams, of



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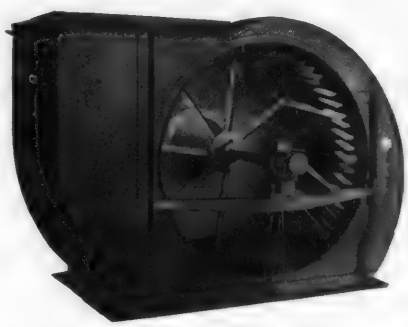


Designed to Meet Every Possible Condition

Slow Speed
Less Power
Noiseless and Durable

Eastern Representatives
L. J. Wing Mfg. Co.; 352 W. 13th St.
New York City

Garden City Fan Co., Mfrs.
Established 1879
1532 McCormick Bldg.
Chicago - - Ill.

A Radiator Valve that Can't Leak

That's the one big important feature about Detroit Packless Radiator Valves that will be of interest to the architect, the owner and the tenant.

It is not a case of "hadn't ought to leak" or "not supposed to leak" but the Detroit Packless **simply can't leak**—absolutely not, they are tight and will always stay tight.

Ordinary valves of the packed type are sure to leak sooner or later and are a constant source of damage, annoyance and expense.

Spoiled floors, stained and discolored walls and ceilings, loose plaster, spotted decorations, furniture and rugs—these are some of the most common evidences of the use of cheap valves.

Detroit Packless Radiator Valves are absolute insurance against such troubles on all kinds of steam heating systems.

You can specify Detroit Packless Radiator Valves with perfect assurance that your clients are getting the utmost to be had in both durability and appearance.

Their first cost is the whole cost. They do not have to be repacked at frequent intervals at considerable expense for labor, and in large buildings there is no necessity of a man devoting a large part of his time to their care.

Detroit Packless Valves prevent the damage which comes from leaking valves and eliminates the necessity of redecorating and making repairs.

And they give permanent satisfaction because they are a **good** valve and a **handsome** one.

Complete information on the subject of radiator valves will gladly be sent upon request. Ask for booklet V-46.

DETROIT LUBRICATOR COMPANY

DETROIT, U. S. A.

CANADIAN DETROIT LUBRICATOR COMPANY, LTD. WALKERVILLE, ONTARIO, CANADA

COOK COUNTY HOSPITAL
Paul Gerhardt, Architect,
E. J. McDonough Co., Heating Contractors
Equipped with Detroit Packless
Radiator Valves

Samuel Sloan & Co., who discussed "Some Ways by Which Service May Become the Right Arm of Success." A report was presented by the Committee on Secured Accounts which favored a plan for the extension of credits through measures of security afforded by the credit forms adopted. The meeting was presided over by L. O. Koven.

St. Paul, Minn.—A building record of $12,498,006 has been made by St. Paul for the first nine months of 1914. This is $408,557 greater than for the whole of 1909, when the city established a building record of $12,089,449. It is estimated that the figures for the balance of the year will bring up the total to over $14,000,000.

James F. Conran has been appointed general sales manager of the Standard Sanitary Mfg. Co., Pittsburgh, Pa. He was until recently manager of the company's New York branch. His headquarters are now in Pittsburgh.

Los Angeles, Cal.—Building Superintendent Backus has ben directed by the city council to submit an ordinance providing for the inspection and approval by the building superintendent of the various classes of gas heaters before same are installed in buildings. It is urged that such inspection and approval should be compulsory because in many instances certain gas heaters have been found to be a menace to health.

RALPH ADAMS CRANE has been appointed to the chair vacated by James Knox Taylor in the Department of Architecture of the Massachusetts Institute of Technology. Announcement is also made that Prof. William H. Lawrence, a graduate of the institute, for many years professor of architectural engineering in the department, has become chairman of the Department of Architecture.

J. IRVINE LYLE, of the Carrier Air Conditioning Company, New York, delivered an illustrated address on the subject of humidity and dust removal at the Modern Science Club, Brooklyn, October 20.

Manufacturers' Notes.

D. T. Williams Valve Co., Cincinnati, O., manufacturers of valves, traps and other heating specialties, announces the retirement of D. T. Williams as president of the company, his place being taken by Robert E. Mullane, formerly treasurer. Francis X. Pund has been made vice-president. The company is planning an enlargement of its plant on Spring Grove avenue to be made early in 1915.

Warren Webster & Co., Camden, N. J., announce that Samuel C. Bloom, who has

The KEY to Efficient-Economical HEATING

Turns any steam heating system into a perfect **VACUUM VAPOR SYSTEM**—an absolute and positive vapor system—without its disadvantages of short life and high cost of installation. The

KOALSAVE VACUUM

AIR VALVE

fulfils every requirement that an air valve should. Entirely automatic, foolproof, leakproof, noiseless.

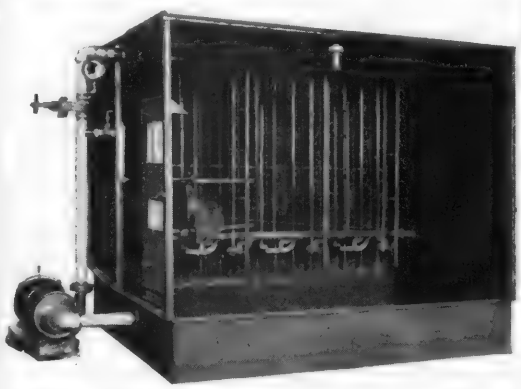
Look into it at once.

KOALSAVE VACUUM VALVE CO.

2552 Park Row Bldg., New York

Air Washing and Cooling for THEATRES

Our theatre installations prove the "ACME" way gives desired results for Washing and Cooling.



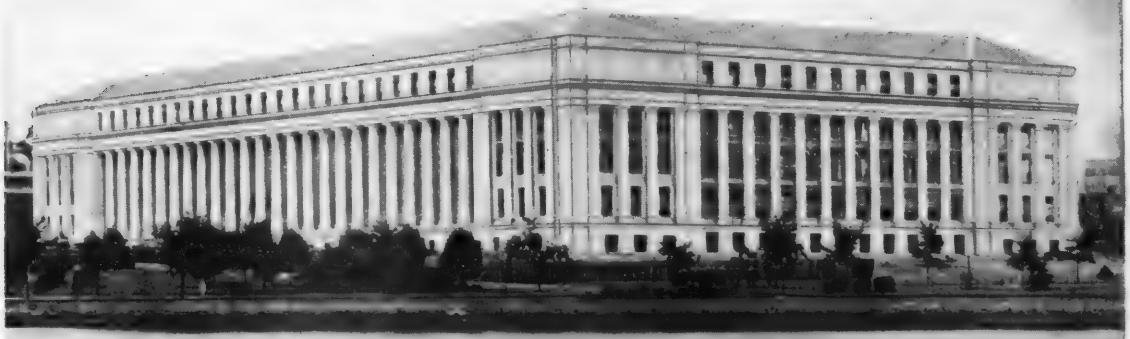
Iroquois Engineering Co.

Manufacturers—"ACME" Air Washers,

CHICAGO, ILL.

Representatives in all principal cities.

Sturtevant



AIR WASHER

Bureau of Engraving and Printing, Washington, D. C.

Sturtevant Air Washers were chosen for this beautiful modern building on account of their superior mechanical and operating features. They have nozzles that will not clog—orifices are large—no adjustments—no packing—perfect spray.

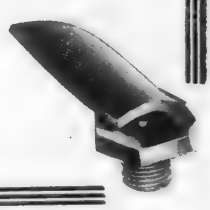
We cannot tell all the desirable details here, but expert Heating and Ventilating Engineers have recommended them for such buildings as the Bancroft Hotel, Worcester, St. Paul's Hospital, Vancouver, and the Standard Oil Building, San Francisco.

Catalogue 225-V sent on request

B. F. Sturtevant Company

Hyde Park, Boston, Mass.

and All Principal Cities of the World



Please mention THE HEATING AND VENTILATING MAGAZINE *when you write.*

been connected with the company's air conditioning department at Camden for several years, has ben transferred to the company's New York office, where he will be in a position to give special attention to this branch of the business, co-operating with architects, engineers and others interested in air conditioning problems.

C. & C. Electric & Mfg. Co., Garwood, N. J., reports having recently closed contracts for ventilating, fan and blower motors for installation in the Yale Club, Grand Central Station and Aetna Life Insurance Company buildings and the Harvard and Knickerbocker Clubs, in New York.

New Incorporations.

Water Works Co., Ferdinand, Ind., capital $21,000, to furnish power, water, heat and light. Directors: E. E. Schreifer, W. R. Sauer, J. A. Sinderman and others.

Elizabethtown Heating Co., Elizabethtown, Ky., capital $1,500. Incorporators: W. C. Montgomery, C. T. Trent, L. A. Faurest and J. R Layman

Serpentine Heater Mfg. Co., Marion, O., capital $25,000, to manufacture heating apparatus. Incorporators: J. Leo Shaw, J. D. King, F. E. Peters, C. A. Kuene and K. H. Marshall.

Meyers Mfg. Co., Lancaster, Pa., to manufacture and deal in steam and hot water heating specialties.

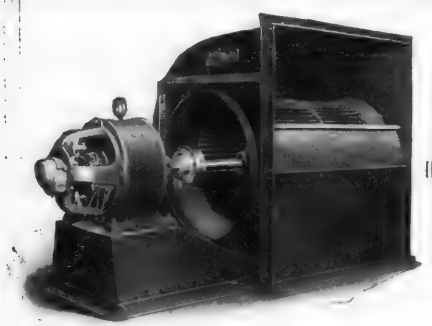
Gordon Sanitary Plumbing Co., Cleveland, O., capital $10,000, to conduct a heating and plumbing business. Among the principals are David Gordon, M. Zwek and B. Passen.

Hanley-Casey Mechanical Equipment Co., Portland, Me., capital $600,000, to contract for "plumbing, decorating, fitting up and improving buildings." Among the principals are Albert F. Jones and T. S. Croteau, both of Portland.

L. H. Mills Co., Bridgeport, Conn., capital $15,000, to conduct a heating, plumbing and metal working business. Incorporators: John T. Haviland, William H. Conley, Jr., and Helen N. Keefer, all of Bridgeport.

Norfolk Plumbing Co., Inc., Norfolk, Va., capital $15,000, to conduct a heating and plumbing business. President, W. B. Gaskins; secretary, L. A. Winslow.

I. F. Whitmarsh Co., Taunton, Mass., capital $5,000, to conduct a heating, plumb-



Reasons Why

You should specify---

"Sirocco"
TRADE MARK.

Multi-Blade Fans and Blowers

1. **Because** they handle twice as much air, consuming less power than paddle wheel fans of same wheel diameter.
2. **Because** their design makes it possible for every bit of energy consumed; produce the maximum amount of air.
3. **Because** their high mechanical efficiency keeps their upkeep costs down to the minimum.

Bulletin No. 109 will be mailed at your request.

AMERICAN BLOWER COMPANY

DETROIT, MICHIGAN U.S.A.

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Many People Do Not Realize the Vast Proportions of Our Business

They know that the name

Sturtevant
(REG. U. S. PAT. OFF.)

is synonymous with **"FANS"** and that Sturtevants are the largest manufacturers in the world of Fans, Heating and Ventilating Apparatus but they do not know of our other products.

Our other products are not experiments but are in universal use all over the globe.

We make Engines, Generating Sets, Turbines, Economizers, Drying Apparatus, Mechanical Draft Apparatus, Motors, Steam Traps, Air Washers and other less important lines.

These products are described in 70 catalogues and bulletins. We have a concentrated description of them in our General Catalog just published. —Catalogue 195-V.

B. F. STURTEVANT CO., Hyde Park, Boston, Mass.
and All Principal Cities of the World

ing and metal working business. President, Edward F. Whitmarsh; treasurer, Irving F. Whitmarsh.

Central Heating & Power Co., Ogden, Utah, capital $25,000. President, B. B. Porter; vice-president, F. J. Kiesel; secretary and treasurer, Charles Ziemer; directors, Albert Scowcroft and D. C. Eccles.

Little Bros. Co., Youngstown, O., capital $2,500, to conduct a heating and plumbing contracting business. Incorporators: N. J. Little, C. C. Little, Stella Little, L. A. Little and W. G. Dorman

Sherlund Co, Brainerd, Minn., capital $25,000, to conduct an engineering and contracting business in heating and plumbing. Incorporators: Louis W. Sherlund, O. M. Hansyn and W. H. Crowell.

Buerkel & Co., Inc., Boston, Mass., capital, $75,000, to take over the heating and plumbing business of Buerkel & Co. Incorporators; John F. Buerkel, William H. Oakes and A. Arthur Jennings.

New Firms and Business Changes.

G. H. Turner Co., Los Angeles, Cal., has opened a heating and plumbing supply house at 1052 North Alameda street. George H. Turner, formerly with the Anderson & Lore Co., is manager.

Fowle & Sons, Milwaukee, Wis., dealers in heating and plumbing supplies, have moved into their new building at 95 West Water street. Alfred Fowle, formerly president of the Central Foundry Co., is at the head of the company.

Contracts Awarded.

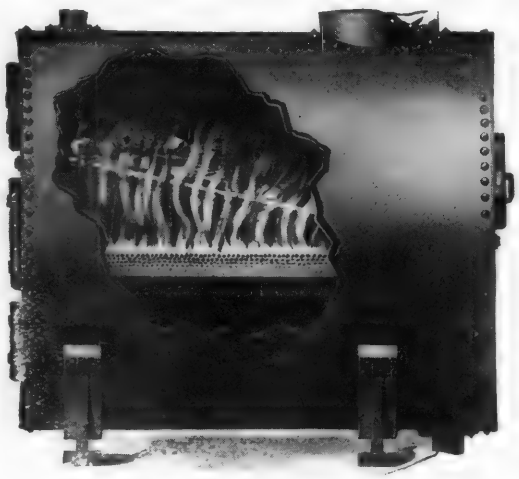
Burlington Plumbing & Heating Co., Burlington, Ia., heating and plumbing new nurses' home of the Burlington Hospital. The Dunham system of heating will be used.

Samuel Apfelbaum, Columbia City, Ind., heating new Atoz printing plant at South Whitley for $2,235.

W. A. Biddle, Brazil, Ind., heating, plumbing, wiring and gas piping Odd Fellows Building in Brazil for $3,204.

American Heating & Ventilating Co., Philadelphia, heating and ventilating Jackson and Madison Buildings for $3,700 for each building. A direct steam heating system, to be operated in combination with the warm air system, was proposed for one of the buildings as an experiment, but was not adopted. Among the various contractors who submitted bids were C. C. Kottcamp & Son, George F. Motter's Sons, York Heating & Ventilating Co. and John Borden & Co., all of Philadelphia.

You kill two birds with one stone



When you install a

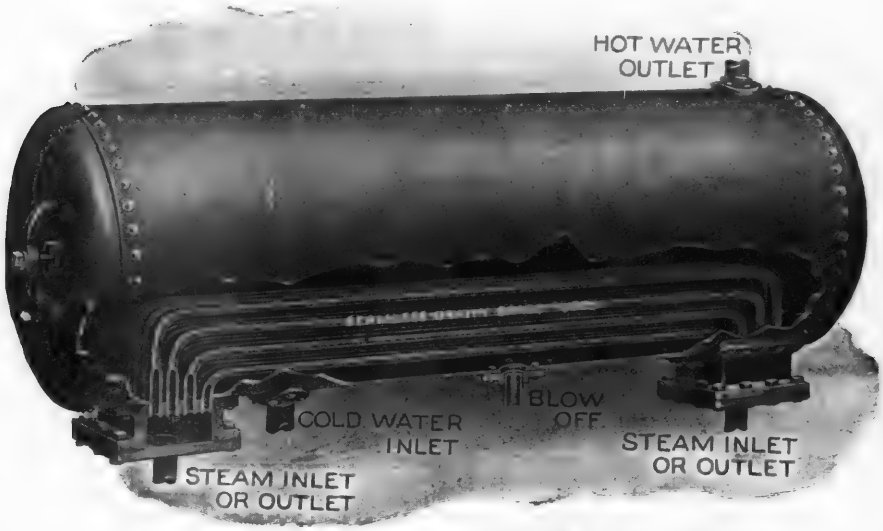
Sims Water Heater and Garbage Burner

You dispose of your garbage and you transform it into fuel.

No troublesome features. They have all been taken care of. No offensive odors, no nuisance, unburnable refuse easily removed, tubes readily cleaned. Heating capacities from 150 to 3,200 gals. water per hour.

Full particulars in Bulletin H-G. B., No. 3. Send for it.

THE SIMS COMPANY, 18th Street, Erie, Pa.



Patented Aug. 26, 1913

TYPE C

THERE IS NO IDLE HEATING SURFACE
IN THE

PATTERSON
HOT WATER TANK

for heating water for domestic or manufacturing purposes

When steam enters the **Expansion Chamber,** it expands and uniformly fills the tubes, whose combined cross-sectional area is several times that of the steam pipe. As rapidly as the steam condenses, due to transmitting its heat to the surrounding water, it is discharged into the **Condensation Chamber.**

The Condensation Chamber has sufficient area to provide for any sudden increase of condensation without permitting it to back up into the tubes to destroy their heating efficiency.

The heating surface in the Patterson Tank consists of a number of parallel seamless drawn brass tubes, both ends of each being expanded into heavy cast iron tube-heads with an improved roller expander. Their ∩ shape provides for the free contraction and expansion of each individual tube without straining, so there is no danger of leakage.

Any combination of storage and heating capacities can be furnished.

FRANK PATTERSON & CO.

26 CORTLANDT STREET, NEW YORK

Representatives in All Principal Cities

Please mention THE HEATING AND VENTILATING MAGAZINE *when you write.*

A. Mathis & Sons, Chicago, heating and ventilating new post office building at Cleveland, O.

Kendall Heating Co., Portland, Ore., heating new University building at Eugene for $23,500; the plumbing contract went to Fiegel & Long, Springfield, at their bid of $3,185.

Leitelt Iron Works, Grand Rapids, Mich., steam heating Perkins Building, at Ionia avenue and Pearl street.

Ruby & Warren, Green Bay, Wis., heating and plumbing station for the Chicago & Northwestern R. R., at that place.

Iron City Heating Co., Pittsburgh, Pa., heating freight station and office building for the Pennsylvania Railroad, in Pittsburgh.

Cleghorn Co., Boston, power, heating and ventilating for new 12-story office building at 56-70 Devonshire street, Boston.

Frank J. Harrington, Fall River, Mass., heating and ventilating new Tucker Street School, at Fall River, for $5,566. The plumbing contract went to William Kennedy, Fall River, whose bid was $2,846.

Petersen-James Co., San Francisco, Cal., steam heating 15-story hotel building on Powell street, for $4,340. The boilers will be equipped for oil burning.

E. V. Lacey, San Francisco, Cal., heating and ventilating new passenger station for the Southern Pacific Railroad at Third, Fourth, King and Townsend streets, for $6,885.

Thos. Haverty Co., Los Angeles, Cal., heating and ventilating Citizens' National Bank Building in Los Angeles, for $31,000; also heating and plumbing the new Van Nuys School in Los Angeles, for $10,000.

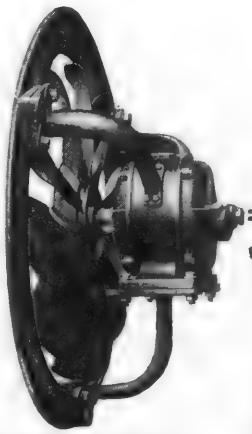
A. Hess, Los Angeles, Cal., heating and ventilating Methodist Hospital building at Los Angeles, for $32,000; also heating new station for the Southern Pacific Railroad in Los Angeles and the new station of the Santa Fe Railroad in San Diego.

A. Gheri & Co., Tacoma, Wash., heating and ventilating new high school building at Eugene on alternative bids of $14,845 and $14,772. The Pacific Heating & Engineering Company will install a vacuum cleaning system for $850.

Alaska Plumbing Co., Portland, Ore., heating and ventilating Fulton Park School in Portland at its bid of $3,024.

W. D. Allen, Seattle, Wash., heating Stuart Building at Fourth avenue and University street, Seattle, for $8,000; the plumbing contract went to the Eckart Plumbing & Heating Co., at its bid of $8,000.

C. M. Masters, Mankato, Minn., heating and ventilating new Science Building for the Moorhead Normal School, Mankato, for $15,000.



'Note these special features of

Westinghouse-Ventura Ventilating Fans

The large, central disk of the fan prevents back flow of air at high speeds—which inevitably happens with older type of fans.

The unusually large number of blades permits the use of slow speed motors; hence operation is very quiet.

The special construction of the blades causes the air to be thrown directly ahead instead of being spread out in an expanded cone.

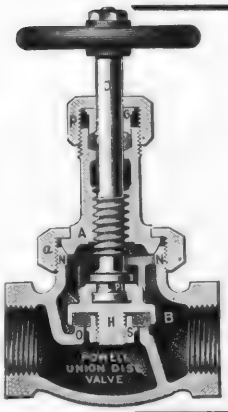
These features taken together mean high efficiency—that is, maximum amount of air moved for given current consumption.

Note also the compactness of the unit, how little the motor will project into the room when the fan is mounted in the wall.

The motor is completely enclosed on all sides. It has ample overload capacity to drive the fan against a strong back pressure of wind.

Publication giving full information, dimensions, prices, etc., sent on request.

Westinghouse Electric & Manufacturing Co.
East Pittsburgh, Pa.



POWELL VALVES

FOR HOT WATER OR STEAM HEATING

Five Points of Efficiency Combined in the POWELL Union Composite Disc Valves

1. Body symmetrically designed and well-proportioned. 2. Metal distributed to meet most wear. 3. Union bevel ground joint connection between body and bonnet, red lead or cement unnecessary to make them tight. 4. Disc-holder "H" permits the use of any make of rubber discs. 5. All parts made to gauge and are interchangeable.

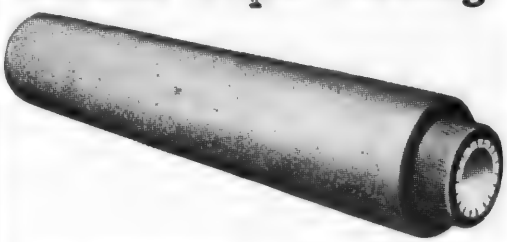
Ask your dealer for "POWELL" VALVES or write us.

THE WM POWELL CO.

DEPENDABLE ENGINEERING SPECIALTIES

CINCINNATI, O.

STANDARD
Steam Pipe Casing



Above cut illustrates the completion of our tin lined

STEAM PIPE CASING

We also make unlined casing.

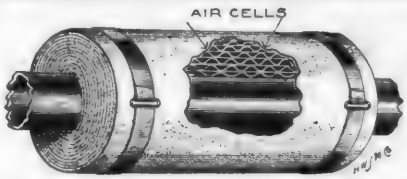
FOR

Insulating Underground Steam Pipes

Write for CATALOG and PRICES.
We furnish all SPECIALS required.

Standard Wood Pipe Co.

Williamsport, Penna.



Your Customers Expect You to Use

J-M ASBESTOCEL

They know its service-record—that it is a big money-saver when used on pipes carrying hot water or low or medium pressure steam, because its countless "dead" air cells prevent heat radiation.

They also know that J-M Asbestocel cannot burn, withstands the hardest usage, and can be easily removed and replaced.

Write nearest Branch for Catalog No. 100

H. W. JOHNS-MANVILLE CO.

Atlanta	Detroit	New Orleans	Seattle
Baltimore	Galveston	New York	Toledo
Boston	Indianapolis	Omaha	
Buffalo	Kansas City	Philadelphia	
Chicago	Los Angeles	Pittsburgh	
Cincinnati	Louisville	Portland	
Cleveland	Memphis	St. Louis	
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(2702)

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Scientific Building Operation

you will find a half hundred articles written by the best authorities on building management in this country. Here are some of the subjects:

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Our special price to subscribers of Buildings and Building Management is $2.00 delivered to you. Otherwise, $2.50. Buildings and Building Management for one year and Scientific Building Operation, $4.00.

PATTERSON PUBLISHING CO., 918 City Hall Square Building, Chicago

Virginia Plumbing & Heating Co., Virginia, Minn., heating and plumbing new high school building at Melrose for $13,000; also furnishing pumps and engines for the city power house at Melrose to be used in connection with a central heating system. The latter contract amounts to $7,000.

Bartley-Kennedy Co., Pittsburgh, Pa., heating County Home for the Poor at Woodville, for $97,550. Fourteen bids were submitted. This company also has the contract for heating the $75,000 residence of A. C. Hoyt at New Castle, Pa.

Huffman-Conklin Co., Columbus, O., heating and ventilating new high school building at Canal Dover.

Barlow Bros. Co., Waterbury, Conn., heating, ventilating and plumbing new municipal building for $75,000.

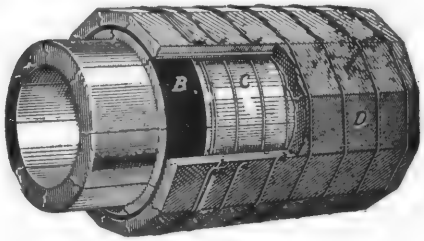
Columbus Heating & Ventilating Co., Columbus, O., heating and ventilating new high school building at Monessen, Pa. The plumbing contract went to the Monessen Plumbing & Electric Co.

John F. Morgan & Sons Co., Lynn, Mass., heat, ventilating and plumbing new Blossom Street School in Lynn, for $24,311.

Furlong-Whittemore Co., Boston, Mass., was the low bidder, at $13,735, for tht heating and ventilating of the Claflin School at Newtonville. The total appropriation available is $8,500, so that the plans will probably have to be revised and new bids secured. Other bids for this work were: Merrill Co., Boston, $13,851; Huey Bros., Boston, $13,937; A. Burlingame & Co., Boston, $14,000; C. H. Sanborn, Boston, $14,000.

American Heating & Construction Co., Los Angeles, Cal., heating and ventilating Kern County High School at Bakersfield, Cal., for $21,990. A central heating plant will be installed with connections to four buildings. This firm is also remodelling the

MOUAT
Graduating Vapor
Heating System
FOR THE BEST CLASS
OF WORK
The Mouat Vapor Heating System, which permits independent regulation of heat in each room, is being used in the best homes, in preference to steam or hot water. Stays sold—means lots of repeat business.
Send for booklet and proposition to Heating Contractors.
THE MOUAT-SQUIRES CO.
1244 W. 4th St., Cleveland, O.
MILD HEALTHFUL HEAT
When You Want It
Where You Want It
In Just the Right Amount



A—Inner Shell, 2 inches thick.
B—Asphaltum Packing.
C—Dead Air Space.
D—Outer Shell, 1 inch thick.

Cover Your Steam Pipes

WITH WYCKOFF'S IMPROVED

CYPRESS COVERING

Made of Gulf Cypress, the wood eternal

Not affected by wet and dry conditions common to steampipe trenches. Will not rot. Lasts twice as long as Pine Casing. Absolutely water and steam tight. Each shell is wound with heavy galvanized wire. Coated all over with the best known preservative—Hydrolene B.

Let us answer your questions and tell you all about it. Booklet on request.

A. WYCKOFF & SON COMPANY

ELMIRA . . N. Y.

Chicago, Ill., 551 West 14th Place

heating plans at the Tegler Hotel, Bakersfield.

Pittelkow Plumbing & Heating Co., Detroit, Mich., heating and plumbing 8-story office building at Woodward avenue and Clifford street.

Moorhead Plumbing & Heating Co., Moorhead, Minn., central heating plant at Concordia College, to cost $5,200.

Wm. G. Schuwirth & Co., San Antonio, Tex., heating and plumbing addition to court house at that place for $10,299.

Business Chances.

Washington, D. C.—Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, for the following-named work:

Until Nov. 10, 1914, for the construction complete, including mechanical equipment, etc., of the U. S. Post Office at Canton, Ill. Two stories and basement, 6,000 sq. ft. ground area.

Until Nov. 12, 1914, for the construction complete, including mechanical equipment, of the U. S. Post Office at The Dailes, Ore. Two stories and basement, 5,080 sq. ft. ground area.

Until Nov. 19, 1914, for the construction complete, including mechanical equipment, of the U. S. Post Office at Fayetteville, Tenn. One story and basement, 3,400 sq. ft. ground area.

Until Nov. 24, 1914, for the construction complete, including mechanical equipment, etc., of the U. S. Post Office at El Reno, Okla. Two stories and basement, 5,270 sq. ft. ground area.

Until Nov. 25, 1914, for the extension, remodeling, etc., of the U. S. Post Office and Custom House at Detroit, Mich.

Until Nov. 30, 1914, for the construction complete, including mechanical equipment, etc., of the U. S. Post Office at Sparta, Wis. One story, mezzanine and basement, 4,000 sq. ft. ground area.

Until Dec. 5, 1914, for the construction complete, including mechanical equipment, etc., of the U. S. Post Office at Morristown, N. J. Two stories and basement, 6,825 sq. ft. ground area.

Until December 4, 1914, for the construction complete, including mechanical equipment, etc., of the U. S. Post Office at Robinson, Ill. One story and basement, 4,500 sq. ft. ground area.

H.P.Equipment

Spencer Turbine Vacuum Cleaners

are manufactured in sizes from ¾ H. P. to 40 H. P.

Send for catalogue

SPENCER TURBINE CLEANER COMPANY

HARTFORD, CT.

American Standard Automatic Air Pump

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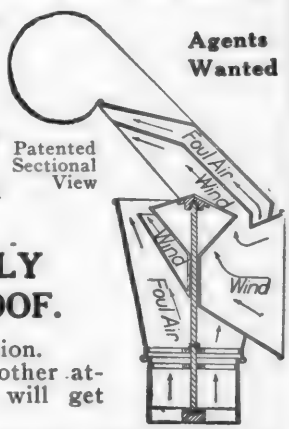

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Until December 17, 1914, for the construction complete, including mechanical equipment, etc., of the U. S. Post Office at Glens Falls, N. Y. Two stories and basement, 6,800 sq. ft. ground area.

Los Angeles, Cal.—Following are recent contracts for heating and ventilation awarded in this locality: Broadway Department Store, Los Angeles, to the Machinery & Electrical Co., Los Angeles; Citizens' National Bank Building, Los Angeles, to Thos. Haverty Co., Los Angeles; Lomanda Park School, Pasadena, Foss & Jones, Pasadena; Altadena School, Pasadena, E. O. Nay & Co., Pasadena; Dale Theatre, Pasadena, E. O. Nay & Co.; Maryland Hotel, Pasadena, Creller & Seaman, Pasadena; El Segundo School, El Segundo, Hoaglan-Hulse Co., Los Angeles; Fremont School, Los Angeles, E. O. Nay & Co.; Garvey School, Los Angeles, E. O. Nay & Co.; Hoover Avenue School, Los Angeles, Western Heating Co., Los Angeles; College Avenue School, Los Angeles, Foss & Jones, Pasadena; Sixty-first Street School, Foss & Jones; Kern County High School, Bakersfield, American Heating Co., Los Angeles.

Presentation to New York Heating Contractor.

George H. Morris, of the firm of Johnson & Morris, New York, heating contractors, was the recipient of a silver service presented by the Master Steam and Hot Water Fitters' Association of New York City, in appreciation of "his devoted loyalty and valued services covering a period of more than twenty-five years." The presentation was made at a regular meeting of the association at 260 West Broadway, New York, September 22. J. E. Jeffrey, chairman of the board of directors of the New York City association, said, in the course of his presentation address that the association had wisely seen fit to entrust to Mr. Morris for a period of over twenty-five years, the adjustment of many of its difficulties and, to a great extent, the regulation of its affairs. He also referred to Mr. Morris' work, as a representative of the association, in the Building Trades Employers' Association of New York City, where, for five successive terms, by the unanimous vote of the representatives of 33 associations of employers and 30 trade unions, he was elected chairman of the general arbitration board of the New York Building Trades.

New Publications.

A STUDY OF THE OXIDATION OF COAL, by Horace C. Porter and O. C. Ralston (Technical Paper 65), has been issued by the Bureau of Mines, Department of the Interior Joseph A. Holmes, director. The publication describes in detail tests and other investigations to determine, among other things, the oxidation of coal at ordinary temperatures, spontaneous heating of coal, factors affecting the ignition of coal and other substances, comparison of rate of oxidation of different coals, and inflammability of coal dust. Size 6 x 9 in. (standard). Pp. 30.

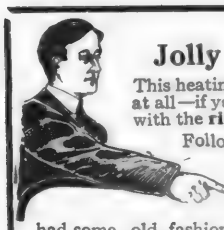
THE THERMAL PROPERTIES OF STEAM, by G. A. Goodenough, has been issued as Bulletin No. 75 of the Engineering Experiment Station of the University of Illinois. The bulletin presents a critical discussion of the experimental investigations of the various thermal properties of steam, an outline of the thermodynamic relations that must be satisfied, and finally the development of a general theory of superheated and saturated steam. As a basis for such a theory the well-known Munich experiments on specific volumes and specific heats are taken and properly correlated through the Clausius relation. The assumed characteristic "equation" for steam is shown to fit the experimental points with extreme accuracy, and other tests are given to show the superiority of the equation over Lunde's equation, which has heretofore been employed. The equation for specific heat gives a corresponding close agreement with the Knoblauch and Mollier points. Simple mathematical manipulation leads to explicit expressions for heat content and entropy, and various tests applied show that the values thus deduced are in excellent agreement with the best experimental evidence. The range of temperature through which the theory appears to be valid extends from 32° to 600° F. for saturated steam. The corresponding upper limit of pressure is above 1,500 lb. per sq. in.

The result of the investigation is a formulation of the properties of steam for which the following claims may be urged: 1. absolute thermodynamic consistence; 2. extreme accuracy; 3. simplicity; 4. flexibility; 5. great range of validity.

Copies of Bulletin No. 75 may be obtained gratis upon application C. R. Richards, acting director of the Engineering Experiment Station, University of Illinois, Urbana, Ill. Size 6 x 9 in. (standard). Pp. 69.

New York School of Heating and Ventilating.

As announced last month, the series of lectures on heating and ventilation which were given last year by Charles A. Fuller to a class of students who met weekly in the World Building, New York, will be continued during the coming winter. The class held its first meeting November 2. Applications should be sent to G. G. Schmidt, secretary, 132 Nassau street, New York.



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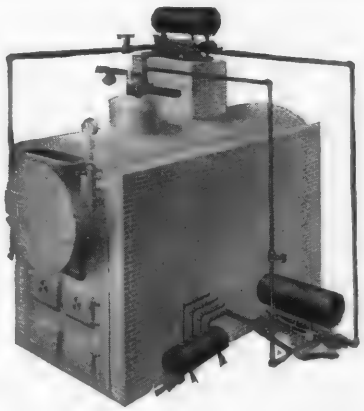

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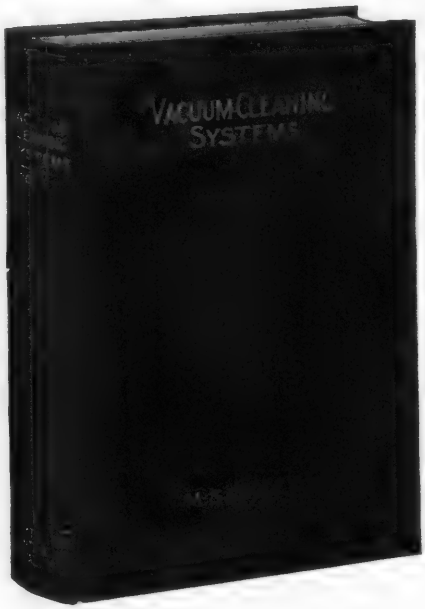

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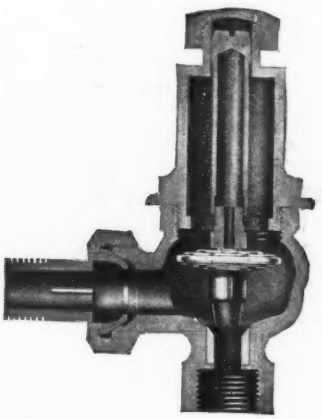

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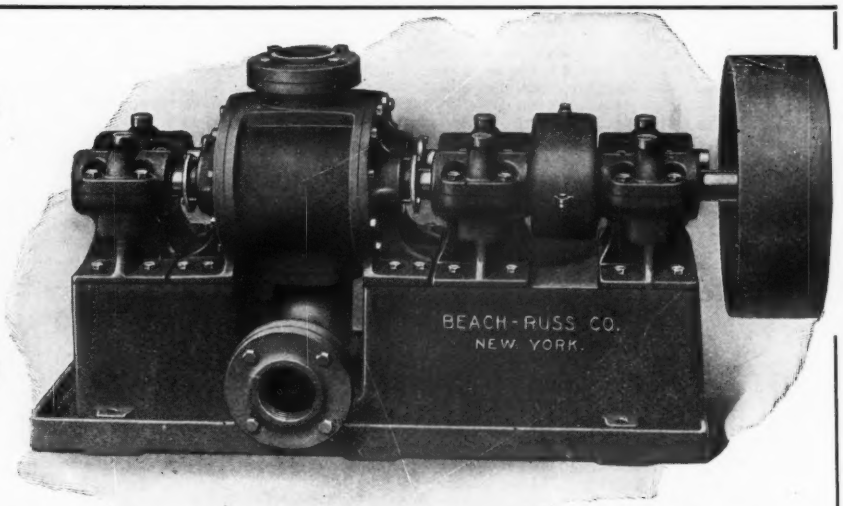

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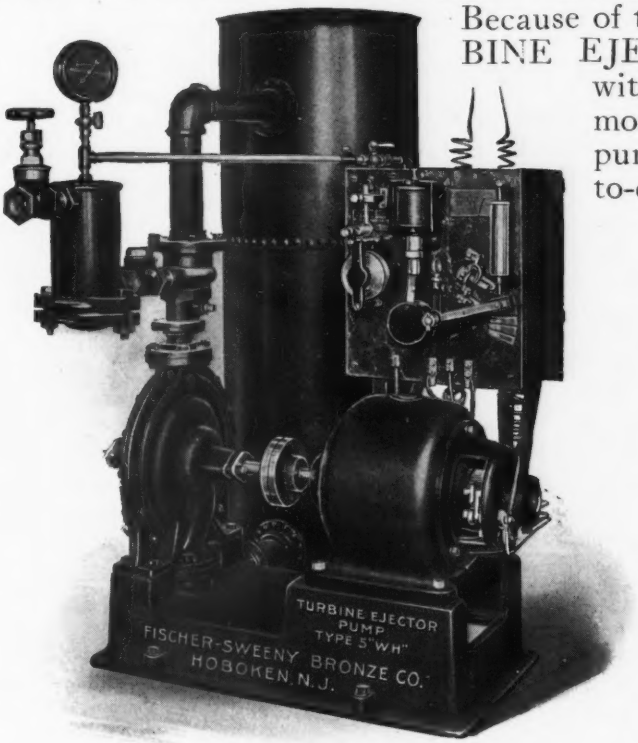

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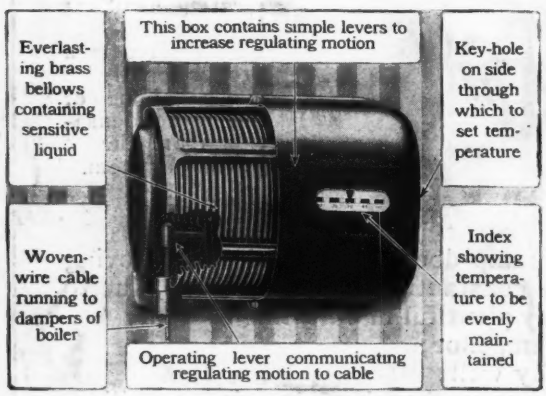
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